Government Documents

ERIGENIA

Number 19
September 2003

Journal of the
Illinois Native Plant Society

ERIGENIA

Number 19, September 2003

The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August, 1982.

 (ISSN 8755-2003)

ERIGENIA STAFF
Editor: Marty Vogt
Technical Editors: Gordon C. Tucker and Kenneth E. Robertson
Production: George D. Johnson
Special thanks to Todd Bittner, Gordon Tucker and Lorna Konsis for additional editing.

COVER ILLUSTRATION
Photo of *Quercus alba,* white oak, at Jim Edgar Panther Creek State Fish and Wildlife Area, by Mike Tyner. Thanks to Guy Sternberg for technical assistance.

MEMBERSHIP
Yearly membership includes a subscription to *Erigenia* and the quarterly newsletter, *Harbinger.*
For more information, write to
Illinois Native Plant Society
Forest Glen Preserve
20301 East 900 North Road
Westville, Illinois 61883
e-mail: ilnps@aol.com

ERIGENIA

NUMBER 19, SEPTEMBER 2003

TABLE OF CONTENTS

About Our Authors

Marlin Bowles is plant conservation biologist at the Morton Arboretum, where he has worked since 1986. His interests include monitoring temporal changes in natural and restored plant populations as well as changes in plant communities.

Charles L. Bushey is the founder and president of Montana Prescribed Fire Services, where he is fire ecologist, prescribed fire specialist and fire behavior analyst. He is also an executive board member of the International Association of Wildland Fire. Previously, Mr. Bushey worked with the U.S. Forest Service Fire Sciences Laboratory, researching fire behavior and fire effects, and as a biologist at the Lake County Forest Preserve District stationed at the Ryerson Conservation Area.

Christopher Dunn is director of research at the Morton Arboretum, a post he has held since 1994. Dr. Dunn is a board member of American Association of Botanical Gardens and Arboreta, and is adjunct professor of biology at the University of Illinois—Chicago.

Bob Edgin is a Field Representative for the Illinois Nature Preserves Commission. His research focuses on the structure and composition of forest and prairie communities and population dynamics of endangered plant species within Illinois nature preserves.

John E. Ebinger is emeritus professor of botany at Eastern Illinois University. His research focuses on the structure and composition of forest, glade, and sand prairie communities in Illinois.

Michael Jones is a botanist with Christopher Burke Engineering, where he conducts vegetation monitoring. He also studies the Illinois distribution of mosses and lichens.

David M. Ketzner is a botanist for the Illinois Natural History Survey, identifying wetlands and searching for rare plants while working on a contract for the Illinois Department of Transportation. David has a B.S. and M.S. in botany from Southern Illinois University and is working on a Ph.D. studying lichens at the University of Illinois.

Richard L. Larimore is a botanist for the Illinois Natural History Survey, identifying wetlands and searching for rare plants while working on a contract for the Illinois Department of Transportation. Richard earned a B.S. in botany from Eastern Illinois University.

Jenny McBride is a GIS specialist at the Morton Arboretum, where she also propagates endangered and threatened species.

Robbin Moran is curator of ferns at the New York Botanical Garden, where his main interests are the evolution, geography and ecology of ferns. Dr. Moran was previously at the University of Arkansas at Little Rock, Aarhaus University in Denmark and the Missouri Botanical Garden. He co-teaches tropical plant systematics and also serves as an associate editor for *Brittonia* and the *American Fern Journal.*

Loy R. Phillippe is the collections manager for the vascular plants and fungi at the Illinois Natural History Survey. His primary duties include herbarium computerization, specimens collection and preparation and the daily operations of the herbarium. Loy earned a B.S. and M.S. in botany from Eastern Illinois University and a Ph.D. in plant taxonomy from the University of Tennessee.

Gordon C. Tucker, an associate professor at Eastern Illinois University, teaches courses in plant taxonomy, plant morphology, dendrology, bryology and ethnobotany. He received his Ph.D. from Duke University and specializes in the taxonomy of grasses and sedges. He recently published a treatment of *Cyperus* and related genera for Flora of North America.

ERIGENIA, Number 19, September 2003, pp. 3—16

VASCULAR FLORA OF THE VERMILION RIVER OBSERVATORY, VERMILION COUNTY, ILLINOIS

Loy R. Phillippe, David M. Ketzner, Richard L. Larimore, and John E. Ebinger
Illinois Natural History Survey, 607 East Peabody Drive
Champaign, Illinois 61820

ABSTRACT: The vascular flora of the Vermilion River Observatory, Vermilion County, Illinois, was studied during the 1996—1998 growing seasons. A total of 475 taxa were found: 13 ferns and fern allies, 5 gymnosperms, 120 monocots, and 337 dicots. Families with the largest number of taxa included Asteraceae with 67 taxa, Poaceae with 53 taxa, and Cyperaceae with 33 taxa, of which 29 were members of the genus *Carex*. Two Illinois threatened species were encountered on the site, *Carex communis* (fibrous-rooted sedge) and *C. willdenowii* (Willdenow's sedge). Three forest communities (south-facing mesic upland forest, north-facing mesic upland forest, dry-mesic upland forest) were surveyed, and density (stems/ha), basal area (m2/ha), importance value, and average diameter were determined for each overstory species. The dry-mesic upland forest was dominated by various species of oaks and hickories. The mesic forested hillsides were dominated by oak species along with a more mesic component of *Acer saccharum* (sugar maple) and *Fagus grandifolia* (American beech).

INTRODUCTION

The Vermilion River Observatory (VRO) is located in east-central Illinois, east-central Vermilion County, approximately 6.4 kilometers (4 miles) southeast of Danville, Illinois, and 1.9 kilometers (1.2 miles) west of Vermillion County, Indiana. Owned by the University of Illinois, the Department of Electrical and Computer Engineering administers the site. Originally the site was purchased in the late 1950s for the construction of a radio telescope. Large amounts of surrounding ground, farm fields and wooded ravines, were also purchased. The telescope was a 183 meters (600 feet)-long and 122 meters (400 feet)-wide giant radio telescope. It was built into a ravine where it was in use for cosmological studies from 1962 to 1967 (McVittie 1962). After the telescope was abandoned the land was retained by the university, much of the flat uplands being farmed, the remainder being used for research as coordinated through the Committee on Natural Areas. The VRO is 198 ha (490 ac) in size with about 26% or 52 ha (129 ac) presently being farmed and the remaining uplands in various stages of succession. The level uplands have all been variously disturbed either through heavy grazing of the forest or clearing of the land for hayfields, cropfields, and the construction of three buildings. The wooded ravines have been subjected to varying degrees of disturbance, particularly extensive cutting around the turn of the century and again in the 1950s, and probably grazed into the 1940s (fig. 1). The present study was undertaken to document the vascular flora of the site and to determine the composition and structure of the native plant communities present.

MATERIALS AND METHODS

At various times throughout the growing season, from spring of 1996 through fall of 1998, field trips were made to the VRO. During each trip voucher specimens were collected, habitat data for each taxon determined, and the plant communities delineated. The material collected was identified and deposited in the herbarium of the Illinois Natural History Survey (ILLS), Champaign, Illinois. Criteria for designating native and non-native taxa followed Fernald (1950), Steyermark (1963), Mohlenbrock (1986), and Gleason and Cronquist (1991).

During the summer of 1997, the forest communities were surveyed using randomly located circular plots 0.0405 ha in size. Six to eight plots were located as near as possible to the center line running through the long axis of each forest type (dry-mesic upland forests and two mesic upland forests, one on a north-facing hillside, the other on a south-facing hillside). In each plot all living and dead-standing woody individuals 10 cm dbh and above were identified and their diameters recorded. From the living-stem data the density (stems/ha), basal area (m2/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. Determination of the IV follows the procedure used by McIntosh (1957), and is the sum of the relative density and

relative dominance of a given species. The densities (stems/ha) of the woody understory species were determined using nested circular plots (0.0001, 0.001, and 0.01 ha) randomly located along transects through the study area. Two additional 0.0001 ha circular plots were located 6 m from each center along north/south compass directions. To determine the number of meters that quadrats were located right (odd-numbered meters) or left (even-numbered meters) from the transect, a random numbers table (single digit) was used. In the 0.0001 ha plots, tree seedlings (<50 cm tall) and all shrubs were counted. In 0.001 ha circular plots, small saplings (≥50 cm tall and <2.5 cm dbh) were counted and, in the 0.01 ha circular plots, large saplings (≥2.5 - <10 cm dbh) were counted. Nomenclature primarily follows Mohlenbrock (1986), Gleason and Cronquist (1991), and Flora of North America Editorial Committee (1993). The plant com-munities were designated using the community classes of White and Madany (1978).

DESCRIPTION OF THE STUDY AREA

The VRO is in the Vermilion River Section of the Wabash Border Division (Schwegman 1973). Located on the Wisconsin Till Plain, the VRO is about 70 km (43 mi) north of the terminal moraine. This very level region, exposed by the retreating glaciers, was dissected by rapid down cutting by the post-glacial river, leaving behind the entrenched Vermilion River and its tributaries. Presently, this section is characterized by rugged topography along the major streams surrounded by relatively flat uplands. The presettlement vegetation was mostly wet-mesic to dry-mesic forests in the ravines and dissected uplands, with mesic prairie, savanna, and open woodlands on the flat to gently rolling uplands (Public Land Survey 1834).

This approximately 198 ha (490 ac) property is situated 6.4 km (4 mi) southeast of Danville, Illinois (T19N, R11W, E1/2 Section 35, W1/2 Section 36, and T18N, R11W, NW1/4 NW1/4 Section 1). The elevation of the VRO ranges from 156 m (512 ft) at the mouth of Getz Ravine to 198 m (650 ft) above sea level at its highest point on the relatively flat uplands in the eastern regions of the property. Maximum relief is only 42 m (138 ft).

The climate of east-central Illinois is continental with cool winters, hot summers, and little or no water deficit at any season of the year (Page 1949, Fehrenbacher et al. 1967). In Danville, Illinois, the mean annual precipitation is 102.1 cm (40.2 in), the month of July having the highest rainfall with a mean of 11.3 cm (4.5 in). The mean annual temperature in Danville is 11.3°C (52.3°F). The hottest month is July with a mean of 24°C (75.2°C) and the coldest month is January with a mean of -3.8°C (25.1°F) (Midwestern Climate Center 1999). The number of frost-free days is 170 to 180.

RESULTS AND DISCUSSION

In this survey, we found 475 species and/or subspecific taxa within 280 genera and 96 families (Appendix). Of these 475 taxa, 77 (16.2%) were not native to Illinois. The fern, fern-allies, and gymnosperms were represented by 10 families, 15 genera, and 18 taxa of which four species (gymnosperms) were exotics planted at the VRO. All other exotics were naturalized. Among the angiosperms, monocots accounted for 12 families, 56 genera, and 120 taxa. Dicots accounted for 74 families, 209 genera, and 337 taxa. The genera represented by the most taxa were *Carex* with 29, *Solidago* with 9, and *Panicum* with 8. The families with the most species and/or subspecific taxa were Asteraceae (67), Poaceae (53), Cyperaceae (33), Rosaceae (24), Fabaceae (16), Scrophulariaceae (13), and Apiaceae (12).

The VRO natural plant community types have been subjected to varying degrees of disturbance, most occurring before the area was purchased by the University of Illinois for the construction of the radio telescope. Below is a description of each plant community. The results of a quantitative vegetation analysis is included for the mesic and dry-mesic upland forest (Figure 1).

Mesic Upland Forest

Two mesic upland forests were surveyed, both in the same steep-sided ravine with an east/west orientation. Mesic upland forest accounted for about 39% or 78 ha (194 ac) of the VRO. They occurred on well drained soils (Marseilles loam and Strawn silt loam) that were very steep (35 to 80 percent), moderately deep, and formed in loamy material and in underlying siltstone residuum (Wacker 1996).

On the mesic upland forested ravine, 14 tree species were tallied on the south-facing hillside with 316 stems/ha and a basal area of 23.45 m2/ha (table 1). *Quercus alba* was the dominant species with 84 stems/ha, an importance value (IV) of 55.4, an average diameter of 29.1 cm, and a majority of the individuals in the smaller diameter classes. *Quercus velutina*, with 58 stems/ha, ranked second in IV (40), and had few individuals in the 10 - 19 cm diameter class. Other common species included *Acer saccharum* with 60 stems/ha, *Q. rubra*, and *Fagus grandifolia*, all with IVs greater than 15. The large number of individuals in the smaller diameter classes indicates that this woods is recovering from past disturbances, particularly cutting. *Acer saccharum* dominates the understory with 51666 seedlings/ha, 3875 small saplings/ha, and 375 large saplings/ha (table 2). *Cornus florida* was second in abundance with 416 seedlings/ha, 1500 small saplings/ha, and 312 large saplings/ha. In comparison, other woody species were rarely encountered, but some *Quercus* spp. reproduction was still occurring. A few seedlings and saplings of *Ostrya virginiana* (hop hornbeam), *Quercus* spp., *Carya* spp., *Prunus serotina*, *Sassafras albidum*, and *Cercis canadensis* were tallied, but these were quite infrequent (table 2).

On the mesic forested ravine, 13 tree species were tallied on the north-facing hillside with 314 stems/ha and a basal area of 25.34 m2/ha (table 1). *Quercus rubra* was the dominant species with 64 stems/ha, an IV of 49.4, an average diameter of 36.1 cm, and was well represented in all diameter classes. *Acer saccharum*, which ranked second with 94 stems/ha, an IV of 46.2, dominated the smaller diameter classes, and had an average diameter of 20.9 cm. *Quercus alba*, which ranked third with 54 stems/ha, an IV of 44.5, was well represented in most diameter classes, and had an average diameter of 37.2 cm. *Fagus grandifolia* ranked fourth with 34 stems/ha, an IV of 22.9, was well represented in most diameter classes, and had an average diameter of 31.5 cm. All remaining species had IVs of less than 10, being minor components of the slope. In the understory, *A. saccharum* was the dominant overstory tree with 21250 stems/ha, 3000 small saplings/ha, and 487 large saplings/ha (table 2). *Cornus florida* was the most common understory tree with 1250 stems/ha, 500 small saplings/ha, and 212 large saplings/ha (table 2). Other species were relatively uncommon, with *Fraxinus americana*, *Fagus grandifolia*, and wild *Prunus serotina* of minor importance. A few seedlings and saplings of *Q. alba*, *Sassafras albidum*, *Ostrya virginiana*, *Liriodendron tulipifera*, and *Amelanchier arborea* were tallied, but these were quite rare (table 2). *Carex communis*, a state threatened herb, was occasional, where it grows on the steep slopes with *Polystichum acrostichoides* and *Carex virescens*.

Dry-mesic Upland Forest

The dry-mesic upland forest accounted for about 13% or 25 ha (62 ac) at the VRO. This community occurred on silt loam soils formed in loess and underlying loamy till and ranged from the well-drained Miami Series (5 to 12% slope) to the moderately well drained Xenia Series (1 to 5% slope) to the poorly drained Fincastle Series (0 to 2% slope) (Wacker 1996). The dry-mesic upland forest was characterized by a dominance of *Quercus* spp. and *Carya* spp. There were 11 tree species total with a total density of 515 stems/ha and a basal area of 27.52 m2/ha (table 1). *Quercus velutina* was dominant with 107 stems/ha, an IV of 54.3, an average diameter of 32.4 cm, and a majority of the individuals in the 20-29 and 30-39 cm diameter classes. *Carya tomentosa*, which ranked second in IV (43.9), dominated the lower diameter classes (< 30 cm) with 139 stems/ha. Other species with IV scores above 10 included *Q. alba* with an IV of 33.5, *C. ovata* with an IV of 33.2, and *C. glabra* with an IV of 23.2. Nearly 400 of the 515 stems/ha were < 30 cm dbh. The large number of individuals in the smaller diameter classes indicate that this woodlot is recovering from past disturbance, particularly cutting. The understory was dominated by *Acer saccharum* with 8889 seedlings/ha and 583 large saplings/ha (table 2). Other common understory species included *C. tomentosa*, *Q. velutina*, *Malus ioensis*, *Fraxinus americana*, *Cornus florida*, and *Prunus serotina*. *Carex willdenowii*, a state threatened herb, was infrequent here, where it grows on a dry ridge with *Dodecatheon meadia* and in a level open woods at the head of a ravine with *Liparis liliifolia* and *Carex jamesii*.

Seeps

This community is characterized by saturated soils caused by circumneutral groundwater flowing to the surface (White and Madany 1978). The seeps accounted for >1% or > 0.5 ha (>1 ac) at the VRO. Though frequent, the seeps were small and poorly developed. They generally occurred at the base of steep slopes in the mesic ravines. Dominant plants included *Acer saccharum*, *A. negundo*, *Cornus alternifolia*, *Impatiens biflora*, and *Pilea pumila*.

Cultural

The cultural communities accounted for about 48% or 95 ha (234 ac) of the VRO. The cultural communities are created and/or maintained by human disturbance. At the VRO the cultural community is represented by croplands, successional fields (former pastureland and orchards), developed land (giant telescope, roads, and buildings), a tree plantation, and four artificial ponds. The common taxa encountered here were introduced and native weedy species.

LITERATURE CITED

Fehrenbacher, J. B., G. O. Walker, and H. L. Wascher. 1967. Soils of Illinois. University of Illinois Agriculture Experiment Station Bulletin 725:1—47.

Flora of North America Editorial Committee. 1993. Flora of North America north of Mexico. Volume 2. Pteridophytes and Gymnosperms. Oxford University Press, New York.

Fernald, M. L. 1950. Gray's manual of botany, 8th. ed. American Book Company, New York.

Gleason, H.A. and A. Cronquist. 1991. Manual of the vascular flora of northeastern United States and adjacent Canada. 2nd ed. The New York Botanical Garden, Bronx.

McIntosh, R. P. 1957. The York Woods. A case history of forest succession in southern Wisconsin. Ecology 38:29—37.

McVittie, G. C. 1962. Illinois' Vermilion River Observatory. Sky and Telescope 24(6):1—4.

Midwestern Climate Center 1999. http://mcc.sws.uiuc.edu

Mohlenbrock, R. H. 1986. Guide to the vascular flora of Illinois. Revised and enlarged edition. Southern Illinois University Press, Carbondale.

Page, J. L. 1949. Climate of Illinois. University of Illinois Agriculture Experiment Station Bulletin 39:93—364.

Public Land Survey. 1834. Illinois State Library Archives. Volume 202.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford.

Steyermark, J. A. 1963. Flora of Missouri. Iowa State University Press, Ames.

Wacker, C. E. 1996. Soil survey of Vermilion County, Illinois. U. S. Department of Agriculture, Soil Conservation Service, in Cooperation with the University of Illinois Agricultural Experiment Station, Urbana.

White, J. and M. H. Madany. 1978. Classification of natural communities in Illinois. Pages 310—505 *in* J. White (editor). Illinois natural areas inventory. Technical report. Illinois Natural Areas Inventory, Urbana.

Table 1 Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in three forest types at the Vermilion River Observatory southeast of Danville, Vermilion County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50+	Total stems/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Mesic Upland Forest (South-facing Hillside)											
Quercus alba	26.0	24.0	16.0	10.0	8.0	84.0	6.74	26.6	28.8	55.4	29.1
Quercus velutina	8.0	22.0	14.0	10.0	4.0	58.0	5.06	18.4	21.6	40.0	31.6
Acer saccharum	26.0	8.0	18.0	6.0	2.0	60.0	4.04	19.0	17.2	36.2	25.6
Quercus rubra	8.0	18.0	14.0	6.0	2.0	48.0	3.65	15.2	15.6	30.8	29.5
Fagus grandifolia	4.0	2.0	6.0	8.0	2.0	22.0	2.47	7.0	10.5	17.5	36.1
Carya ovata	6.0	2.0	4.0	--	--	12.0	0.44	3.8	1.9	5.7	19.9
Carya tomentosa	8.0	--	--	--	--	8.0	0.11	2.5	0.5	3.0	13.3
Sassafras albidum	8.0	--	--	--	--	8.0	0.12	2.5	0.5	3.0	13.9
Others (6 species)	6.0	6.0	2.0	2.0	--	16.0	0.82	5.0	3.4	8.4	--
Totals	100.0	82.0	74.0	42.0	18.0	316.0	23.45	100.0	100.0	200.0	--
Mesic Upland Forest (North-facing Hillside)											
Quercus rubra	10.0	12.0	12.0	20.0	10.0	64.0	7.33	20.4	29.0	49.4	36.1
Acer saccharum	58.0	20.0	6.0	6.0	4.0	94.0	4.15	29.9	16.3	46.2	20.9
Quercus alba	6.0	18.0	4.0	14.0	12.0	54.0	6.90	17.3	27.2	44.5	37.2
Fagus grandifolia	6.0	12.0	6.0	8.0	2.0	34.0	3.05	10.8	12.1	22.9	31.5
Quercus velutina	2.0	2.0	10.0	--	--	14.0	1.11	4.5	4.4	8.9	30.7
Carya ovata	4.0	6.0	4.0	--	--	14.0	0.71	4.5	2.8	7.3	24.7
Tilia americana	2.0	2.0	8.0	--	--	12.0	0.87	3.8	3.4	7.2	29.0
Sassafras albidum	8.0	--	--	2.0	--	10.0	0.40	3.2	1.6	4.8	19.4
Others (5 species)	10.0	4.0	4.0	--	--	18.0	0.82	5.6	3.2	8.8	--
Totals	106.0	76.0	54.0	50.0	28.0	314.0	25.34	100.0	100.0	200.0	--
Dry-mesic Upland Forest											
Quercus velutina	2.7	37.3	50.7	13.3	2.7	106.7	9.25	20.7	33.6	54.3	32.4
Carya tomentosa	80.0	58.7	2.7	--	--	141.4	4.49	27.6	16.3	43.9	19.3
Quercus alba	10.7	21.3	16.0	16.0	2.7	66.7	5.65	13.0	20.5	33.5	31.3
Carya ovata	50.7	37.3	10.7	--	--	98.7	3.85	19.2	14.0	33.2	21.2
Carya glabra	24.0	29.3	10.7	--	--	64.0	2.98	12.4	10.8	23.2	22.8
Others (6 species)	29.4	2.7	2.7	2.7	--	37.5	1.30	7.1	4.8	11.9	--
Totals	197.5	186.6	93.5	32.0	5.4	515.0	27.52	100.0	100.0	200.0	--

Table 2 Densities (stems/ha) of the woody seedlings (<50 cm tall), small saplings (≥50 cm tall <2.5 cm dbh), and large saplings (≥2.5 - <10 cm dbh) in three forest types at the Vermilion River Observatory, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings
Mesic Upland Forest (South-facing Hillside)			
Acer saccharum	51666.7	3875.0	375.0
Fraxinus americana	1250.0	--	--
Fagus grandifolia	833.3	625.0	50.0
Cornus florida	416.7	1500.0	312.5
Ostrya virginiana	416.7	--	25.0
Quercus spp.	1250.1	--	12.5
Carya spp.	416.7	--	25.0
Prunus serotina	416.7	--	--
Sassafras albidum	416.7	--	--
Cercis canadensis	--	--	12.5
Totals	57083.6	6000.0	812.5
Mesic Upland Forest (North-facing Hillside)			
Acer saccharum	21250.0	3000.0	487.5
Fraxinus americana	4166.7	250.0	--
Cornus florida	1250.0	500.0	212.5
Fagus grandifolia	1250.0	750.0	37.5
Prunus serotina	1250.0	125.0	--
Quercus alba	1250.0	--	12.5
Sassafras albidum	416.7	--	12.5
Ostrya virginiana	416.7	--	12.5
Liriodendron tulipifera	416.7	--	--
Amelanchier arborea	--	--	25.0
Totals	31666.8	4625.0	800.0
Dry-mesic Upland Forest			
Acer saccharum	8888.9	333.3	583.3
Carya tomentosa	5000.0	--	33.3
Quercus velutina	3333.3	--	--
Malus ioensis	2222.2	--	--
Fraxinus americana	2222.2	--	--
Cornus florida	1666.7	333.3	116.7
Prunus serotina	1111.1	--	100.0
Fagus grandifolia	555.6	--	--
Ostrya virginiana	555.6	166.7	50.0
Ulmus rubra	--	--	16.7
Quercus alba	--	--	16.7
Carya ovata	--	--	16.7
Totals	25555.6	833.3	933.4

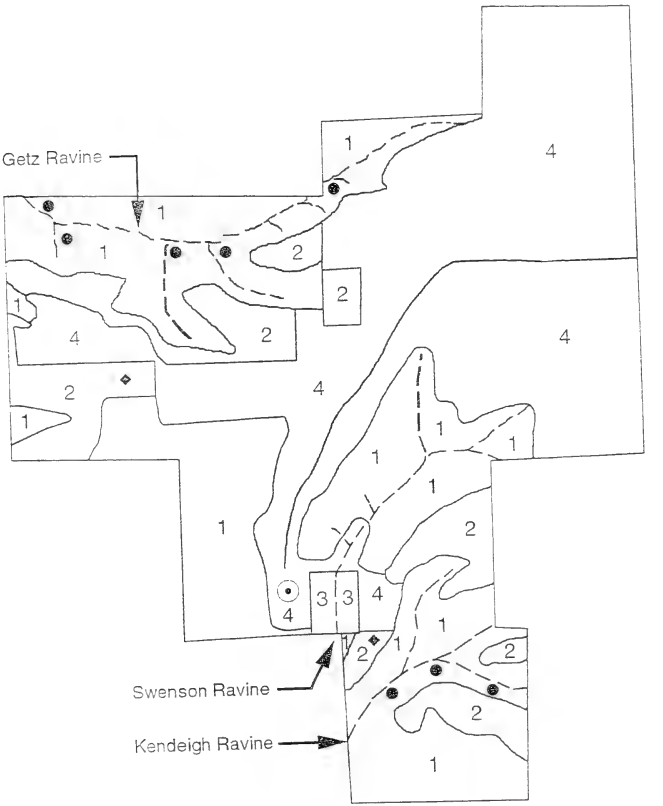


Figure 1. Natural communities and rare plant locations of Vermilion River Observatory, Vermilion County, Illinois.

1. mesic upland forest
2. dry-mesic upland forest
3. giant radio telescope
4. cultural communities

- • *Carex communis*
- ◆ *Carex willdenowii*
- ⊙ biological station

APPENDIX

The vascular taxa encountered and vouchered at the Vermilion River Observatory are listed below by major groups, pteridophytes (ferns and fern allies) and spermatophytes (seed plants). The spermatophytes are further divided into gymnosperms (non-flowering seed plants) and angiosperms (flowering seed plants); the latter are divided into monocots and dicots. The families, genera, and species are alphabetically arranged within each group. Preceding the binomial, state threatened species are indicated by a **T** and non-native species are indicated by an asterisk (*). After the binomial and authority, the collecting numbers, preceded by the initial of the collector's name, are given (P for Loy R. Phillippe, H for Mary Harper.

PTERIDOPHYTES

ASPLENIACEAE

Asplenium platyneuron (Linnaeus) Britton, Sterns & Poggenburg: P 27637

DRYOPTERIDACEAE

Athyrium filix-femina (Linnaeus) Mertens var. *angustum* (Willdenow) G. Lawson: P 27906

Cystoperteris protrusa (Weatherby) Blasdell: P 27638

Deparia acrostichoides (Swartz) M. Kato: P 27586, P 28370

Polystichum acrostichoides (Michaux) Schott: P 27611

EQUISETACEAE

Equisetum arvense Linnaeus: P 27069, P 27118

Equisetum hyemale Linnaeus: P 27258

LYCOPODIACEAE

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub: P 27066

OPHIOGLOSSACEAE

Botrychium dissectum Sprengel: P 28347

Botrychium virginianum (Linnaeus) Swartz: P 27265

OSMUNDACEAE

Osmunda claytoniana Linnaeus: P 27907

PTERIDACEAE

Adiantum pedatum Linnaeus: P 27612

THELYPTERIDACEAE

Phegopteris hexagonoptera (Michaux) Fée: P 27603, P 28369

SPERMATOPHYTES: GYMNOSPERMS

CUPRESSACEAE

Juniperus virginiana Linnaeus: P 28859

**Thuja occidentalis* Linnaeus: P 28874

PINACEAE

**Picea glauca* (Moench) Voss: P 27242

**Pinus strobus* Linnaeus: P 28873

**Pinus sylvestris* Linnaeus: P 28872

SPERMATOPHYTES: ANGIOSPERMS

MONOCOTS

ALISMACEAE

Sagittaria latifolia Willdenow: P 29477

ARACEAE

Arisaema dracontium (Linnaeus) Schott: P 27360

Arisaema triphyllum (Linnaeus) Schott: P 27260

COMMELINACEAE

Tradescantia subaspera Ker: P 27614

Tradescantia virginiana Linnaeus: P 27259

CYPERACEAE

Carex albursina Sheldon: P 27247

Carex artitecta Mackenzie: P 27127

Carex blanda Dewey: P 27244, P 27269

Carex careyana Dewey P 27231

Carex cephalophora Willdenow: P 27366, P 27367, P 27607

T *Carex communis* Bailey: P 27215, P27355

Carex emoryi Dewey: P 27117

Carex frankii Kunth: P 27635

Carex glaucodea Tuckerman: P27395

Carex gracilescens Steudel: P 27214, P 27359, P 27393, P 27620

Carex granularis Willdenow: P 29672

Carex grisea Wahlenberg: P 27394

Carex hirsutella Mackenzie: P 27397; 27569

Carex hirtifolia Mackenzie: P 27249

Carex hitchcockiana Dewey: P 29665

Carex jamesii Schwein: P 27261; 27380

Carex laxiculmis Schwein: P 27229, P 27356, P27376, P 27382, P 29667

Carex normalis Mackenzie: P 27347, P 27348, P 27361, P 29671

Carex oligocarpa Willdenow: P 27373, P 27610

Carex pensylvanica Lamarck: P 27134

Carex radiata (Wahlenberg) Dewey: P 27381

Carex rosea Willdenow: P 27379

Carex shortiana Dewey: P 27396

Carex sparganioides Willdenow: P 27374

Carex stipata Muhlenberg: P 29668

Carex swanii (Fernald) Mackenzie: P 27392, P27593

Carex virescens Willdenow: P 27368
Carex vulpinoidea Michaux: P 27633
T *Carex willdenowii* Schkuhr: P 27365, P28861
Cyperus acuminatus Torrey & Hooker: P 28559
Eleocharis obtusa (Willdenow) Schultes: P 27871
Scirpus georgianus Harper: P 27576
Scirpus pendulus Muhlenberg: P 27645

DIOSCOREACEAE
Dioscorea quaternata (Walter) J.F. Gmelin: P 29466

IRIDACEAE
Sisyrinchium angustifolium Miller: P 27352

JUNCACEAE
Juncus interior Wiegand: P 27568
Juncus tenuis Willdenow: P 29171
Juncus torreyi Coville: P28544
Luzula multiflora (Retz) Legeune: P27145

LEMNACEAE
Lemna minor Linnaeus: P 29456
Wolffia columbiana Karst: P 29455
Wolffia papulifera Thompson: P 29455-B

LILIACEAE
Allium burdickii (Hanes) A.G. Jones: P 27358
Allium canadense Linnaeus: P 28863
Erythronium albidum Nuttall: P 27070, P27074
Hypoxis hirsuta (Linnaeus) Coville: 27222
Lilium michiganense Farwell: P 27609
Polygonatum biflorum (Walter) Elliot: P 27618
Smilacina racemosa (Linnaeus) Desfontaines: P 27387
Trillium flexipes Rafinesque: P 27124, P 27613
Trillium nivale Riddell: P 27058
Trillium recurvatum Beck: P 27125
Uvularia grandiflora J.E. Smith: P 27129

ORCHIDACEAE
Corallorhiza odontorhiza (Willdenow) Nuttall: P 28549
Cypripedium calceolus Linnaeus var. *pubescens* (Willdenow) Correll: P 27232
Galearis spectabilis (Linnaeus) Rafinesque: P 27216
Liparis liliifolia (Linnaeus) Rich: P 27363
Spiranthes cernua (Linnaeus) L.C. Richard: P 28537
Spiranthes ovalis Lindley: P 29462

POACEAE
Agrostis gigantea Roth: P 27577
Agrostis hyemalis (Walter) Britton, Sterns & Poggenburg: P 27580
Agrostis perennans (Walter) Tuckerman: P 28355, P 28403
Andropogon virginicus Linnaeus: P 28343
Aristida longespica Poiret: P 28401
Aristida oligantha Michaux: P 28406
**Arrhenatherum elatius* (Linnaeus) Presl: P 27604
**Avena sativa* Linnaeus: P MH258
Brachyelytrum erectum (Schreber) Beauvois: P 27627
**Bromus inermis* Leysser: P 27621
Bromus pubescens Muhlenberg ex Willdenow: P 27632, P 27898
**Bromus racemosus* Linnaeus: P 29661
Chasmanthium latifolium (Michaux) Yates: P 29460
Cinna arundinacea Linnaeus: P 27904
**Dactylis glomerata* Linnaeus: P27401
Danthonia spicata (Linnaeus) Roemer & Schultes: P 27629
Diarrhena americana P. Beauvois: P 28396
**Digitaria ischaemum* (Schreber) Schreber ex Muhlenberg: P 28538
**Digitaria sanguinalis* (Linnaeus) Scopoli: P 28561
Elymus hystrix Linnaeus: P 27606
Elymus villosus Muhlenberg in Willdenow: P 27887
Elymus virginicus Linnaeus: P 27640
Eragrostis pectinacea (Michaux) Nees: P 27911
Festuca obtusa Biehler: P 27390
**Festuca pratensis* Hudson: P 27400
Glyceria striata (Lamarck) Hitchcock: P 27564
**Hordeum jubatum* Linnaeus: P 29659
Hordeum pusillum Nuttall: P 29660
Leersia oryzoides (Linnaeus) Swartz: P 29476
Leersia virginica Willdenow: P 27899, P 28362
Muhlenbergia frondosa (Poiret) Fernald: P 28361, P 28557
Muhlenbergia schreberi J.F. Gmelin: P 29472
Muhlenbergia sobolifera (Muhlenberg) Trinius: P 28352
Muhlenbergia tenuiflora (Willdenow) Britton, Sterns & Poggenburg: P 28359
Panicum boscii Poiret var. *boscii:* P 27579, H 250
Panicum capillare Linnaeus: P 28411
Panicum clandestinum Linnaeus: P 27596
Panicum dichotomiflorum Michaux: P 29491
Panicum dichotomum Linnaeus: P 27909
Panicum linearifolium Scribner var. *linearifolium:* P 27582
Panicum villosissimum Nash: P 27572, P 27595
Panicum virgatum Linnaeus: P 28539
Paspalum ciliatifolium Michaux: P 28404
**Phleum pratense* Linnaeus: P 27570
**Poa compressa* Linnaeus: P 27575
**Poa pratensis* Linnaeus: P 27399
Poa sylvestris Gray: P 27385
**Setaria faberi* R.A.W. Hermann: P 27897
**Setaria glauca* (Linnaeus) Beauvois: P 29189
**Setaria viridis* (Linnaeus) Beauvois: P 29194
Sphenopholis obtusata (Michaux) Scribner var. *major* (Torrey) Erdman: P 27364
Sporobolus vaginiflorus (Torrey) Wood: P 28560
Tridens flavus (Linnaeus) Hitchcock: P 28349

SMILACACEAE
Smilax hispida Muhlenberg: P 28871
Smilax lasioneuron Hooker: P 28864

TYPHACEAE
Typha latifolia Linnaeus: P 28546

DICOTS

ACANTHACEAE

Ruellia strepens Linnaeus: P 27559

ACERACEAE

Acer negundo Linnaeus: P 27059
Acer saccharinum Linnaeus: P 28868
Acer saccharum Marshall: P 28866

ANACARDIACEAE

Rhus glabra Linnaeus: P 27571
Toxicodendron radicans (Linnaeus) Kuntze: P 29203

ANNONACEAE

Asimina triloba (Linnaeus) Dunal: P 27246

APIACEAE

Chaerophyllum procumbens (Linnaeus) Crantz: P 27217
Cryptotaenia canadensis (Linnaeus) De Candolle: P 27639
**Daucus carota* Linnaeus: P 27874
Erigenia bulbosa (Michaux) Nuttall: P 27054
Osmorhiza claytonii (Michaux) Clarke: P 27388
Osmorhiza longistylis (Torrey) De Candolle: P 27241, P 27248
**Pastinaca sativa* Linnaeus: P 29481
Sanicula canadensis Linnaeus: P 27561
Sanicula odorata (Rafinesque) Pryer & Phillippe: P 27272
Sanicula trifoliata Bicknell: P 27616
Taenidia integerrima (Linnaeus) Drude: P 27220
Thaspium barbinode (Michaux) Nuttall: P 27218

APOCYNACEAE

Apocynum androsaemifolium Linnaeus: P 28860
Apocynum cannabinum Linnaeus: P 27628

ARALIACEAE

Aralia racemosa Linnaeus: P 27888
Panax quinqefolius Linnaeus: P 27245

ARISTOLOCHIACEAE

Aristolochia serpentaria Linnaeus var. *serpentaria*: P 27583
Asarum canadense Linnaeus var. *reflexum* (Bicknell) Robins: P 27144

ASCLEPIADACEAE

Asclepias exaltata Linnaeus: P 27624
Asclepias incarnata Linnaeus: P 29201
Asclepias syriaca Linnaeus: P 27598
Asclepias verticillata Linnaeus: P 27875

ASTERACEAE

**Achillea millefolium* Linneaus: P 27566
Ambrosia artemisiifolia Linneaus: P 29488
Ambrosia trifida Linneaus: H 261
Antennaria parlinii Fernald var. *parlinii:* P 27068
Antennaria plantaginifolia (Linnaeus) Rich var. *ambigens* (Greene) Cronquist: P 27135
Aster cordifolius Linnaeus: P 28389, P 28550, P 28554
Aster lanceolatus Willdenow: P 28386, P 28562
Aster lateriflorus (Linnaeus) Britton: P 28341, P 28387, P 28391
Aster novae-angliae Linnaeus: P 28344
Aster pilosus Willdenow: P 28338
Aster puniceus Linnaeus: P 28542
Aster shortii Lindley in Hooker: P 28353, P 28548
Bidens aristosa (Michaux) Britton var. *retrorsa* (Sherff) Wunderlin: P 28337, P 28540
Bidens cernua Linnaeus: P 28384
Bidens frondosa Linnaeus: P 28377, P 28563, P 29479
Cacalia atriplicifolia Linnaeus: P 27882, P 28365
**Cichorium intybus* Linnaeus: P 27878
Cirsium discolor (Muhlenberg) Sprengel: P 28413
**Cirsium vulgare* (Savi) Tenore: P 29176
Conyza canadensis (Linnaeus) Cronquist: P 29487
Eclipta prostrata (Linnaeus) Linnaeus: P 29485
Erigeron annuus (Linnaeus) Persoon: P 27630
Erigeron philadephicus Linnaeus: P 27391
Erigeron pulchellus Michaux: P 27221
Erigeron strigosus Muhlenberg: P 27591
Eupatorium altissimum Linnaeus: P 28414, P 28547, P 29496
Eupatorium coelestinum Linnaeus: P 28409
Eupatorium fistulosum Barratt: P 28388
Eupatorium perfoliatum Linnaeus: P 29457
Eupatorium purpureum Linnaeus: P 28553
Eupatorium rugosum Houttuyn: P 28360
Eupatorium serotinum Michaux: P MH262
Euthamia graminifolia (Linnaeus) Salisbury: P 28346
Gnaphalium obtusifolium Linnaeus: P 28408
Helianthus divaricatus Linnaeus: P 27900
Helianthus strumosus Linnaeus: P 28380
Heliopsis helianthoides (Linnaeus) Sweet: P 27880
**Hieracium caespitosum* Dumortier: P 28870
Hieracium scabrum Michaux: P 28402, P29461, P29474
Krigia biflora (Walter) S.F. Blake: P 27375
Lactuca canadensis Linnaeus: P 27896
Lactuca floridana (Linnaeus) Gaertner: P 29475
**Leucanthemum vulgare* Lamarck: P 27573
Liatris scabra (Greene) K. Schumann: P 28344, H 256
**Matricaria matricarioides* (Lessing) Porter: P 29657
Polymnia canadensis Linnaeus: P 27903, H 252
Prenanthes alba Linnaeus: P 28363
Prenanthes altissima Linnaeus: P28358
Prenanthes crepidinea Michaux: P 28862
Rudbeckia hirta Linnaeus: P 27626
Rudbeckia laciniata Linnaeus: P 28381
Rudbeckia triloba Linnaeus: P 28393
Senecio glabellus Poiret: P 27226
Senecio pauperculus Michaux: P27253
Solidago caesia Linnaeus: P 28356
Solidago canadensis Linnaeus: P 28407
Solidago flexicaulis Linnaeus P 28366
Solidago gigantea Aiton: P 28378
Solidago juncea Aiton: P 27872, P 27884

Solidago missouriensis Nuttall: P 28541
Solidago nemoralis Aiton: P 28339
Solidago speciosa Nuttall: P 28342, H 255
Solidago ulmifolia Muhlenberg: P28354, P 28390
**Sonchus asper* (Linnaeus) Hill: H259
**Tragopogon pratensis* Linnaeus: P 27597
Verbesina alternifolia (Linnaeus) Britton: P 28379
Vernonia gigantea (Walter) Trelease: P 28410

BALSAMINACEAE
Impatiens pallida Nuttall: P 28382
Impatiens capensis Meerburgh: P 27889

BERBERIDACEAE
**Berberis thunbergii* de Candolle: P 27116
Caulophyllum thalictroides (Linnaeus) Michaux: P 27073
Podophyllum peltatum Linnaeus: P 27267

BETULACEAE
Carpinus caroliniana Walter: P 27608
Corylus americana Walter: P 29459
Ostrya virginiana (Miller) K. Koch: P 29480

BORAGINACEAE
Hackelia viginiana (Linnaeus) I.M. Johnston: P 29207
Myosotis verna Nuttall: P 27351

BRASSICACEAE
Arabis laevigata (Muhl.) Poiret: P 27219
**Barbarea vulgaris* R. Brown var. *arcuata* (Opiz) Fries: P 27113
**Capsella bursa-pastoris* (Linnaeus) Medikus: P 29662
Cardamine concatenata (Michaux) Swartz: P 27061
Cardamine douglassii (Torrey) Britton: P 27052
Cardamine parviflora Linnaeus var. *arenicola* (Britton) O.E. Schultz: P 27251
**Draba verna* Linnaeus: P 27071
**Lepidium campestre* (Linnaeus) R. Brown: P 27236
**Lepidium densiflorum* Schrader: P 27404
Rorippa islandica (Oeder) Borbas var. *fernaldiana* Butters & Abbe: P 27634
Rorippa sessiliflora (Nuttall) Hitchcock: P 29658

CALLITRICHACEAE
Callitriche terrestris Rafinesque: P 27588

CAMPANULACEAE
Campanula americana Linnaeus: P 27881
Lobelia inflata Linnaeus: P 28405, H 254
Lobelia siphilitica Linnaeus: P 28364
Triodanis perfoliata (Linnaeus) Nieuwland: P 29663

CAPRIFOLIACEAE
**Lonicera japonica* Thunberg: P 29185
**Lonicera maackii* (Ruprecht) Maximowicz: P 29188
**Lonicera morrowi* Gray: P 27266
Sambucus canadensis Linnaeus: P 27562
Viburnum acerifolium Linnaeus: P27893
Viburnum prunifolium Linnaeus: P 27270

CARYOPHYLLACEAE
**Arenaria serpyllifolia* Linnaeus: P 27600
**Cerastium vulgatum* Linnaeus: P 27240
**Dianthus armeria* Linnaeus: P 27574
Paronychia canadensis (Linnaeus) Wood: P 29494
Silene stellata (Linnaeus) Aiton f.: P 27894
Silene virginica Linnaeus: P 27262
**Stellaria media* (Linnaeus) Villars: P 27224

CELASTRACEAE
Celastrus scandens Linnaeus: P 29175
Euonymus atropurpurea Jacquin: P 28564
Euonymus obovatus Nuttall: P 28394

CLUSIACEAE
**Hypericum perforatum* Linnaeus: P 27594
Hypericum punctatum Lamarck: P 27876

CONVOLVULACEAE
Calystegia sepium (Linnaeus) R. Brown: P 27913
**Ipomoea hederacea* Jacquin: H 257
Ipomoea pandurata (Linnaeus) G. Meyer: P 29174

CORNACEAE
Cornus alternifolia Linnaeus f.: P 27370
Cornus drummondii C.A. Meyer: P 27560
Cornus florida Linnaeus: P 27268
Cornus racemosa Lamarck: P 27590

ELAEAGNACEAE
**Elaeagnus angustifolia* Linnaeus: P 27264

EUPHORBIACEAE
Acalypha rhomboidea Rafinesque: P 28372
Acalypha virginica Linnaeus: P 28412
Chamaesyce maculata (Linnaeus) Small: P 28376, P 29492
Chamaesyce nutans (Lagascay) Small: P 29493

FABACEAE
Amphicarpaea bracteata (Linnaeus) Fernald: P 28357
Cercis canadensis Linnaeus: P27076
**Coronilla varia* Linnaeus: P 27622
Desmodium canescens (Linnaeus) de Candolle: P 28351
Desmodium glutinosum (Muhlenberg) Wood: P 27892
Desmodium nudiflorum (Linnaeus) de Candolle: P 27891
Desmodium rotundifolium de Candolle: P28398
Gleditisia triacanthos Linnaeus: P 27403
Lespedeza virginica (Linnaeus) Britton: P 28399
**Medicago lupulina* Linnaeus: P 27623
**Melilotus alba* Medikus: P 27567
**Melilotus officinalis* (Linnaeus) Pallas: P 27558
Senna marilandica (Linnaeus) Link: P 27895
**Trifolium hybridum* Linnaeus: P 29172
**Trifolium pratense* Linnaeus: P 29192
**Trifolium repens* Linnaeus: P 29177

FAGACEAE
Fagus grandifolia Ehrhart: P 28392
Quercus alba Linnaeus: P 28415-A
Quercus imbricaria Michaux: P 27233
Quercus macrocarpa Michaux: P 28558
Quercus muehlenbergii Engelman: P 27384, P 28395, P 29666
Quercus palustris Muenchhausen: P 29484
Quercus rubra Linnaeus: P 28371
Quercus velutina Lamarck: P 27901

FUMARIACEAE
Dicentra canadensis (Goldie) Walpers: P 27122
Dicentra cucullaria (Linnaeus) Berhnardi: P 27056

GERANIACEAE
Geranium maculatum Linnaeus: P 27263

HIPPOCASTANACEAE
Aesculus glabra Willdenow: P 27121

HYDROPHYLLACEAE
Hydrophyllum appendiculatum Michaux: P 27228
Hydrophyllum canadense Linnaeus: P 27615
Hydrophyllum virginianum Linnaeus: P 27357

JUGLANDACEAE
Carya cordiformis (Wang.) K. Koch: P 28857
Carya glabra (Mill.) Sweet: P 27235, P 29173
Carya ovalis (Wang.) Sargent: P 28867
Carya ovata (Miller) K. Koch: P 29204
Carya tomentosa (Poiret) Nuttall: P 29463
Juglans nigra Linnaeus: P 29206

LAMIACEAE
Agastache nepetoides (Linnaeus) Kuntze.: P 29458
Blephilia hirsuta (Pursh) Bentham: P 27890
**Glechoma hederacea* Linnaeus: P 27386
Mimulus alatus Aiton: P 29196
Monarda fistulosa Linnaeus: P 27883
Prunella vulgaris Linnaeus var. *elongata* Bentham: P 27873
Scutellaria incana Biehler: P 27885
Scutellaria ovata Hill var. *ovata:* P 27602
Stachys tenuifolia Willdenow var. *tenuifolia:* P 29183
Teucrium canadense Linnaeus var. *virginicum* (Linnaeus) Eaton: P 27879

LAURACEAE
Lindera benzoin (Linnaeus) Blume: P 27057
Sassafras albidum (Nuttall) Nees: P 27115

LIMNANTHACEAE
Floerkea proserpinacoides Willdenow: P 27077, P 27142

LINACEAE
Linum medium (Planchon) Britton var. *texanum* (Planchon) Fernald: P 27581

MAGNOLIACEAE
Liriodendron tulipifera Linnaeus: P 27383

MALVACEAE
**Abutilon theophrastii* Medikus: P 28374
**Hibiscus trionum* Linnaeus: P 29490
Sida spinosa Linnaeus: P 28373

MENISPERMACEAE
Menispermum canadense Linnaeus: P 29184

MOLLUGINACEAE
**Mollugo verticillata* Linnaeus: P 29489

MORACEAE
**Maclura pomifera* (Rafinesque) Schneider: P 29464
**Morus alba* Linnaeus: P 27346

OLEACEAE
Fraxinus americana Linnaeus: P 29205
**Ligustrum vulgare* Linnaeus: P 29486

ONAGRACEAE
Circaea lutetiana Linnaeus ssp. *canadensis* (Linnaeus) Ascherson & Magnus: P 27605
Epilobium ciliatum Rafinesque: P 28543
Epilobium coloratum Biehler: P 29478
Oenothera biennis Linnaeus: H 260

OROBANCHACEAE
Conopholis americana (Linnaeus) Wallroth: P 27377
Epifagus virginiana (Linnaeus) Barton: P 28368

OXALIDACEAE
Oxalis dillenii Jacquin: P 29202
Oxalis stricta Linnaeus: P 29670
Oxalis violacea Linnaeus: P 27223

PAPAVERACEAE
Sanguinaria canadensis Linnaeus: P 27055
Stylophorum diphyllum (Michaux) Nuttall: P 27143

PASSIFLORACEAE
Passiflora lutea Linnaeus: P 29465

PHYTOLACCACEAE
Phytolacca americana Linnaeus: P 29467

PLANTAGINACEAE
**Plantago lanceolata* Linnaeus: P 27599
Plantago rugelii Decaisne: P 27902

PLATANACEAE
Platanus occidentalis Linnaeus: P 27584

POLEMONIACEAE
Phlox divaricata Linnaeus ssp. *laphamii* (Wood) Wherry: P 27119
Polemonium reptans Linnaeus: P 27139

POLYGALACEAE
Polygala sanguinea Linnaeus: P 27908, P 28348
Polygala senega Linnaeus: P 27636, P 28551

POLYGONACEAE
**Polygonum arenastrum* Bor: P 29195
**Polygonum persicaria* Linnaeus: P 29200
Polygonum punctatum Elliott: P 29198
Polygonum virginianum Linnaeus: P 29471
**Rumex acetosella* Linnaeus: P 28869
**Rumex crispus* Linnaeus: P 27563
**Rumex obtusifolius* Linnaeus: P 27625

PORTULACACEAE
Claytonia virginica Linnaeus: P 27075

PRIMULACEAE
Dodecatheon meadia Linnaeus: P 27128
Lysimachia lanceolata Walter: P 27643
Samolus valerandii Linnaeus: P 28385

PYROLACEAE
Monotropa uniflorus Linnaeus: P 28367

RANUNCULACEAE
Actaea alba (Linnaeus) Miller: P 27256
Anemone virginiana Linnaeus: P 27644
Anemonella thalictroides (Linnaeus) Spach: P 27060
Hepatica nobilis Miller var. *acuta* (Pursh) Steyermark: P 27053
Hydrastis canadensis Linnaeus: P 27243
Isopyrum bitnernatum (Rafinesque) Torrey & Gray: P 27051
Ranunculus abortivus Linnaeus: P 27138
Ranunculus hispidus Michaux var. *caricetorum* (Greene) T. Duncan: P 27250
Ranunculus micranthus Nuttall: P 27137
Ranunculus recurvatus Poiret: P 27371
Thalictrum dioicum Linnaeus: P 27130

ROSACEAE
Agrimonia parviflora Aiton: P 29482
Agrimonia pubescens Wallroth: P 27905, P 28552, P 28555
Agrimonia rostellata Wallroth: P 29470
Amelanchier arborea (Michaux f.) Fernald: P 27065, P 27146
Crataegus crus-galli Linnaeus: P 27398
Crataegus mollis (Torrey & Gray) Scheele: P 29178
Crataegus pruinosa (Wendland) K. Koch: P 27362
Crataegus punctata Jacques: P 29186
Geum canadense Jacques: P 27565
Geum vernum (Rafinesque) Torrey & Gray: P 27273
Malus coronaria (Linnaeus) Mill.: P 27271
**Malus pumila* Miller: P 27111
**Potentilla recta* Linnaeus: P 27601
Potentilla simplex Michaux: P 27237
Prunus americana Marshall: P 27114
Prunus munsoniana Wright & Hedrick: P 27112
Prunus serotina Ehrhart: P 27252
**Pyrus communis* Linnaeus: P 27910
Rosa carolina Linnaeus: P 27592
**Rosa multiflora* Thunberg: P 27578
Rubus allegheniensis Porter: P 27353
Rubus flagellaris Willdenow: P 27349
Rubus occidentalis Linnaeus: P 27354
Rubus pensylvanicus Poiret: P 27350

RUBIACEAE
Diodea teres Walter: P 28400
Galium aparine Linnaeus: P 27389
Galium circaezans Michaux: P 27642: H 253
Galium concinnum Torrey & Gray: P 27631
Galium triflorum Michaux: P 27642

RUTACEAE
Ptelea trifoliata Linnaeus: P 27378
Zanthoxylum americanum Miller: P 27148

SALICACEAE
Populus deltoides Marshall: P 27067
Populus grandidentata Michaux: P 28858
Salix exigua Nuttall: P 27072, P 27136, P 27257
Salix nigra Marshall: P 27254

SAXIFRAGACEAE
Heuchera americana Linnaeus var. *hirsuticaulis* (Wheelock) Rosendahl, Butters & Lakela: P 27369
Hydrangea arborescens Linnaeus: P 27619
Mitella diphylla Linnaeus: P 27131, P 27617
Penthorum sedoides Linnaeus: P 29199
Ribes cynosbati Linnaeus: P 27123
Ribes missouriense Nuttall: P 27133

SCROPHULARIACEAE
Agalinis tenuifolia (Vahl) Rafinesque: P 28340
Aureolaria flava (Linnaeus) Farwell: P29495
Collinsia verna Nuttall: P 27141
Gratiola neglecta Torrey: P 27589
Pedicularis canadensis Linnaeus: P 27132
Penstemon calycosus Small: P 28865
Scrophularia marilandica Linnaeus: P 28397
**Verbascum blattaria* Linnaeus: P 27870
**Verbascum thapsus* Linnaeus: P 27912
**Veronica arvensis* Linnaeus: P 27238
**Veronica officinalis* Linnaeus: P 27213
Veronica peregrina Linnaeus: P 29656
Veronicastrum virginicum (Linnaeus) Farwell: P 29468

SIMAROUBACEAE
**Ailanthus altissima* (Miller) Swingle: P 29187

SOLANACEAE
Physalis heterophylla Nees: P 28556
**Physalis longifolia* Nuttall: P 29193
Solanum carolinense Linnaeus: P 29191
Solanum ptycanthum Dunal: P 29190

STAPHYLEACEAE
Staphylea trifolia Linnaeus: P 27225

TILIACEAE
Tilia americana Linnaeus: P 29182

ULMACEAE
Celtis occidentalis Linnaeus: P 29483
Ulmus americana Linnaeus: P 27062
Ulmus rubra Muhlenberg: P 27063, P 27078

URTICACEAE
Boehmeria cylindrica (Linnaeus) Swartz: P 29297
Laportea canadensis (Linnaeus) Weddell: P 28383
Parietaria pensylvanica Muhlenberg: P 29664
Pilea pumila (Linnaeus) Gray: P 28375

VALERIANACEAE
Valeriana pauciflora Michaux: P 27227, P 27585

VERBENACEAE
Phryma leptostachya Linnaeus: P 27886
Verbena urticifolia Linnaeus: P 27877

VIOLACEAE
Hybanthus concolor (T.F. Forster) Sprengel: P 27372
Viola pratincola Greene: P 27120
Viola pubescens Aiton var. *eriocarpa* (Schwein) Russell: P 27126
**Viola rafinesquii* Greene: P 27239
Viola striata Aiton: P 27140
Viola triloba Schwein var. *triloba:* P27255

VITACEAE
Parthenocissus quinquefolia (Linnaeus) Planchon: P 29473
Vitis aestivalis Michaux: P 27587
Vitis riparia Michaux: P 27402

ERIGENIA, Number 19, September 2003, pp. 17—30

THE VASCULAR FLORA AND VEGETATION OF ROBESON HILLS NATURE PRESERVE: AN OLD-GROWTH BEECH-MAPLE FOREST IN SOUTHEASTERN ILLINOIS

Bob Edgin[1]

ABSTRACT: The vascular flora of the 64 ha Robeson Hills Nature Preserve and Robeson Hills Land and Water Reserve (Lawrence County, Illinois) was studied during the 1999 and 2000 growing seasons. A total of 233 species and subspecific taxa, including the state-endangered *Iresine rhizomatosa* Standley (bloodleaf), were observed. Of that number, 10 were fern, fern allies, and gymnosperms, 38 monocots, and 185 dicots. Sampling was conducted using a stratified-random line-strip method. A total of 58 taxa were encountered during sampling. Among the overstory trees, *Acer saccharum* Marsh. (sugar maple) ranked first in importance value (IV = 39.9), accounting for 54.3% of all individuals encountered and 33.9% of the total basal area. Of the sugar maple encountered, 61.4% were < 30.0 cm dbh. *Fagus grandifolia* Ehrh. (beech) ranked second in importance value (IV = 18.2), being present in low numbers in all diameter classes. In the understory, sugar maple was the most abundant species in the large and intermediate sapling categories. *Asimina triloba* (L.) Dunal (pawpaw) was most abundant in the small sapling category. Beech was not represented well in large and intermediate sapling and groundlayer categories, but was present in moderate numbers in the small sapling category. *Hydrophyllum canadense* L. (Canada waterleaf) and *Laportea canadensis* (L.) Wedd. (stinging nettle) were the most abundant herbaceous species.

INTRODUCTION

At the time of European settlement about 61% of Illinois was covered with prairie, the flat to gently rolling areas in prairie and savanna, the more rugged terrain in woodland and forest vegetation (Kuchler 1964, Iverson et al. 1991, Ebinger 1997). In this rugged terrain, tree species composition often varied from one locality to another with oaks (*Quercus* spp.) and hickories (*Carya* spp.) being the common forest species on drier, mostly upland sites. Mesophytic species such as elm (*Ulmus* spp.), ash (*Fraxinus* spp.), and sugar maple (*Acer saccharum* Marsh.) were associated with the dissected ravines and narrow river floodplains (Braun 1950, Anderson 1983, Cowell and Jackson 2002). At the eastern edge of Illinois, particularly in the Wabash Border Natural Division, many of these forests contained American beech (*Fagus grandifolia* Ehrh.), tuliptree (*Liriodendron tulipifera* L.), sugar maple, and other tree species typically found in the forests to the east of Illinois (Schwegman 1973).

Beech-maple forests, which usually contained some species of oaks and hickories, reached the western limit of their range in east-central and southern Illinois. The few remaining examples of this forest type are primarily restricted to locations that have steep, deeply dissected ravine systems, narrow valleys, and narrow to broad ridges. These forest stands usually contain a beech-maple component with a rich herbaceous layer on the mesic slopes and an oak-hickory component on the ridges and more level uplands. Presently, few examples of this forest type remain in Illinois, and these remnants have been variously modified by past disturbance such as cutting and grazing, the lack of fire regime, and exotic species invasion.

Three examples of this community type located in the Wabash River Basin have been dedicated as Illinois Nature Preserves (McFall and Karnes 1995). The Robeson Hills Nature Preserve (RHNP) and Robeson Hills Land and Water Reserve contain one of these protected beech-maple forests. The objectives of the study were (1) to investigate the historical background of this forest, (2) to determine the composition and structure of the forest vegetation, (3) to analyze changes in the community composition that may have occurred since the forest was last studied in 1973, and (4) to establish permanent plots to more precisely monitor changes in the forest composition and structure.

[1] Illinois Nature Preserves Commission, IDNR, One Natural Resources Way, Springfield, Illinois 62702-1271

DESCRIPTION OF THE STUDY AREA

Robeson Hills Nature Preserve is located approximately 13 km east of Lawrenceville, Lawrence County, Illinois (Location 21, T3N, R10W). Located in the Wabash Border Natural Division, Robeson Hills is a strongly dissected 400 ha erosional remnant that rises some 30 m above the floodplain of the Wabash River (Schwegman 1973). The bedrock is Pennsylvanian-aged sandstone and shale that is overlain with thick deposits of loess.

The climate is continental, characterized by cold winters and hot, humid summers. Weather station records for Vincennes, Indiana, about 3.2 km from the preserve, reports the annual precipitation as 106.4 cm, which falls mostly as rain during the period of March to September (Weather.com). Average precipitation is highest during the month of May (11.2 cm) and lowest during February (6.6 cm). January is the coldest month, having a mean temperature of -3° C with an average high of 2° C and an average low -8° C. A record low of -31° C was recorded on December 23 and 24, 1989. July is the hottest month, having a mean temperature of 24° C with an average high 31° C and an average low of 18° C. A record high of 38° C was recorded on July 22, 1983, and June 26, 1988. The frost-free growing period averages 180 days per year (Fehrenbacher and Odell 1956).

Prior to European settlement, Robeson Hills was occupied by native Americans of the Archaic, Woodland, and Mississippian cultures for about 5000 years (Rillo 1978). Archeological evidence suggests that the Archaics were a semi-nomadic people who used the area primarily as a winter camp site. The Woodland Culture was a more settled culture with its people living in small villages and tending small gardens. The Mississippian culture was based on agriculture with its people living in large villages and honoring their deceased through burial in mounds.

Jean Baptiste Racine is believed to have been the first person of European descent to claim ownership of the hills, doing so in 1763. Toussaint Dubois purchased the hills in 1807 and sold them to William Robeson in 1877. The hills remained in the ownership of the descendants of William Robeson, until the north portion consisting of 218 ha (545 acres), was purchased by Vincennes University, Vincennes, Indiana, in 1964.

Vincennes University dedicated 48.6 ha of old-growth beech-maple forest as an Illinois nature preserve in 1972 (McFall and Karnes 1990). In 1996, the 7.3 ha Dark Hollow addition to the RHNP was dedicated and the 8.8 ha Robeson Hills Land and Water Reserve was registered in the Illinois Registry of Land and Water Reserves. These tracts, which total 64 ha (160 acres), are old growth beech-maple forest that have been subjected to relatively little human disturbance and will be subsequently referred to as Robeson Hills Nature Preserve. Beech and sugar maple predominate on the steep slopes, being replaced by tulip tree, *Celtis occidentalis* L. (hackberry), and *Platanus occidentalis* L. (sycamore) on the more gentle slopes. *Quercus alba* L. (white oak), *Quercus rubra* L. (red oak), and *Fraxinus americana* L. (white ash) are more common on the narrow, drier ridges.

MATERIALS AND METHODS

The vascular flora of Robeson Hills Nature Preserve was studied during the growing seasons of 1999 and 2000. During each trip, all new flowering or fruiting species encountered were collected, the specimens identified and deposited in the Stover-Ebinger Herbarium (EIU) of Eastern Illinois University, Charleston. Criteria for designating native and non-native taxa follow Gleason and Cronquist (1991) and Mohlenbrock (1986). All vascular plant taxa observed are presented in the Annotated Species List (Appendix I). Nomenclature follows Mohlenbrock (1986).

Sampling was conducted on June 29 and July 4, 2000, using the stratified-random line-strip method of Lindsay (1955) as modified by Donselman (1973), Levenson (1973), and Dunn (1978). Using this method, overstory trees, saplings, shrubs, and groundlayer strata were sampled simultaneously in nested rectangular plots positioned along transect lines.

Sample plots for the overstory trees (≥10.0 cm dbh) were delimited using a 100 m tape divided into 25 m sections. Overstory trees were sampled in 10 m x 25 m (0.025 ha) plots using a telescoping PVC pole 2.5 m long to determine the boundaries of the plots. All trees with centers that were located within two pole lengths (5 m) of either side of the tape were included in the sample. Aspect of the plot, taxon, and diameter were recorded for each individual located within the boundaries of each plot.

Large saplings (5.0 cm dbh—9.9 cm dbh), intermediate saplings (≥ 2.5 cm dbh; ≤ 4.9 cm dbh), small saplings (≥ 50.0 cm tall; ≤ 2.4 cm dbh), shrubs, and the groundlayer (woody seedlings <50.0 cm tall and all herbaceous taxa) were sampled in nested rectangular plots located at the zero, 25 m, 50 m, and 75 m mark of the tape. Aspect, taxa, and the number of individuals were recorded for all individuals that fell within one meter from the tape along a section 2.5 m long (0.00025 ha plot).

When all plots along the 100 m transect line were sampled, a section of 1/2" steel conduit marked "Edgin 2000" was driven at each end of the tape to facilitate the relocation of the transect line in future studies. A new 100 m transect line, laying a minimum of 25 m distant from the first line and perpendicular to the ravine was then established and the sampling procedures repeated. This process was replicated along ten 100 m transect lines, providing a total of 40 plots in each category.

Density (trees/ha), basal area (m^2/ha), frequency (%), relative density, relative dominance, relative frequency, importance value (relative density + relative dominance + relative frequency)/3 and average dbh (cm) were determined for each taxon of overstory tree. Density (stems/ha), frequency (%), relative density, relative frequency, and importance value (relative density + relative frequency)/2 was determined for each taxon in the small, intermediate, and large sapling, shrub, and groundlayer categories.

The Floristic Quality Index (FQI) was determined for the preserve using the coefficient of conservatism assigned to each taxon by Taft et al. (1997). The FQI is ostensibly a weighted index of the species richness (N), and is the arithmetic product of the average coefficient of conservatism (CC) and the square root of the species richness ($\sqrt{N}$) of an inventory site [FQI = CC($\sqrt{N}$)]. For relatively small areas that are fairly intensively studied floristically, the FQI gives a rapid means of comparison and an indication of the floristic integrity of the site.

RESULTS AND DISCUSSION

The flora of RHNP consisted of 233 species and subspecific taxa in 157 genera and 79 families. Of these taxa, 12 (5.2%) are not native to Illinois. The gymnosperms and pteridophytes were poorly represented, accounting for only 10 taxa (4.3% of all taxa) in 9 genera and 5 families. Among the angiosperms, monocots accounted for 38 species and subspecific taxa (16.3% of all taxa) in 24 genera and 8 families, while dicots accounted for 185 species and subspecific taxa (79.4% of all taxa) in 124 genera and 66 families. The families with the highest representation of taxa were the Asteraceae (25 taxa), Poaceae (10), Cyperaceae (10), Lamiaceae (9), Fagaceae (8), and Ranunculaceae (8). Genera with the highest representation were *Carex* (9), *Quercus* (7), *Carya* (5), and *Polygonum* (5). See Appendix I for a listing of the vascular taxa encountered.

Overstory Composition and Structure

Twenty taxa were encountered in the overstory sampling having a density of 186 trees/ha and a total basal area of 33.144 (m^2/ha) (Table 1). Sugar maple was the dominant tree species, having an importance value of 39.9. It had the highest frequency, occurring in 85.5% of all plots, accounted for 54.3% of all trees encountered, and 33.9% of the basal area (m^2/ha) (Table 1). It was present in all diameter classes, but was particularly abundant in the 10—39.9 cm diameter classes, accounting for 67.9% of the trees encountered in those classes. Sugar maple was the only tree species encountered in 7 of the 40 plots. Of those plots, four were located on northeast-facing slopes, two on southwest-facing slopes, and one on the east-facing slope of a narrow v-shaped valley.

Beech ranked second in importance value (IV=18.2), basal area, and frequency (Table 1). It occurred in 57.5% of the plots and was present in low numbers in all diameter classes. Hackberry (IV=6.4) was the only other taxon to be represented by more than 10 individuals and was most common in the smaller diameter classes.

Over time, a mature, undisturbed forest is expected to experience a slight decrease in tree density and a corresponding increase in total basal area average (Abrell and Jackson 1977, Poulson and Platt 1996, Shotola et al. 1992, Swanson and Vankat 2000). Over the past 27 years, the forest at RHNP has experienced a decrease in tree density (from 233 to 186 trees/ha) and a decrease in basal area (from 38.88 to 33.144 m^2/ha). Beech has experienced a decline in density, basal area and importance value, despite an increase in average tree diameter, while sugar maple has experienced an increase in importance value, basal area, and density. Since no permanent plots were established during the previous study, some variation in the data may be attributed to sampling error. However, it seems unlikely that such a dramatic shift in the composition of the forest could be attributed solely to this factor, and the even distribution of beech throughout all diameter classes would seem to eliminate the possibility of a catastrophic event.

The shift in the forest structure may be explained by the dynamic equilibrium that exists within mature beech-maple forests. Poulson and Platt (1996) found that beech has the competitive advantage over sugar maple during times of low treefall rates and small canopy gap formation. Sugar maple has the advantage during periods of multiple treefalls and large canopy gaps. Seven dead-standing trees, a few fallen trees, and several bowls created by rootballs of fallen trees were noted during the study. It is possible that the forest experienced a period of increased canopy gap formation after the previous study was conducted. The associated increase in understory light levels could have given the competitive edge to sugar maple, which is apically dominant and has a greater vertical growth potential than beech. This hypothesis is further supported by the presence of hackberry, a shade- sensitive species, in the smaller diameter classes and its absence from the larger diameter classes.

In the understory, sugar maple was the dominant species in the large sapling category, accounting for 51.6% of the individuals, and was encountered in plots on most aspects (Table 2). No beech were encountered in this category. Sugar maple was also dominant in the intermediate sapling category, where it occurred in 62.5% of the plots and represented 71.3% of the individuals encountered (Table 2).

Pawpaw was the dominant species in the small sapling category, occurring in 95.0% of the plots, and accounting for 80.6% of the individuals encountered (Table 2). Sugar maple and beech ranked second and third, respectively, in importance value, with beech being poorly represented.

With the exception of *Staphylea trifolia* L. (bladdernut), shrub density was very low (Table 3). Two non-native shrubs, *Euonymus alata* (Thunb.) Sieb. (winged wahoo) and *Rosa multiflora* Thunb. (multiflora rose), were occasionally encountered.

The abundance of sugar maple, combined with the relative lack of beech in the sapling layers, would indicate that sugar maple will continue to increase in importance if treefall and canopy gap formation occur at frequent intervals (Poulson and Platt 1996). However, beech could gain the competitive advantage if treefall and canopy gap formation rates decline and the light intensity in the understory decreases. Most other taxa are expected to remain as minor components of the forest.

In the groundlayer, 48 taxa were encountered. Of that number, 25 were herbaceous with *Hydrophyllum canadense* L. (Canada waterleaf), *Laportea canadensis* (L.) Wedd. (stinging nettle), *Asarum canadense* L. (wild ginger), *Cystopteris protrusa* (Weatherby) Blasd. (fragile fern), *Viola* spp. (violet) being the most abundant (Table 4). Sugar maple, white ash, pawpaw, *Prunus serotina* Ehrh. (wild black cherry), and *Ulmus rubra* Muhl. (red elm) were the most abundant woody seedlings, with pawpaw and red elm being present primarily as rootsprouts from more mature individuals.

The average coefficient of conservatism, when calculated for all taxa, was 3.72 and the FQI was 56.3. When calculated for native taxa only, the average coefficient of conservatism and FQI were 4.04 and 58.6, respectively. According to Taft et al. (1997), sites that have an FQI greater than 35 may be regionally noteworthy, while sites with an FQI greater than 45 are often of statewide significance.

Slope Aspects

Sufficient data were available to determine the characteristic taxa of the northeast- and southwest-facing slopes in the study area. General characteristics of these two areas are discussed below.

Northeast-Facing Slopes (16 plots)

In the overstory trees, sugar maple ranked first in importance value, occurred in 87.5% of the plots, and accounted for nearly 56% of the trees encountered and 42.4% of the basal area (Table 5). Beech ranked second in importance value and was present in 56.3% of the plots. Tulip tree was the only other tree with an importance value greater than 5. Sugar maple ranked first in importance value in the large and intermediate sapling categories and second in the small saplings. Pawpaw ranked second in the intermediate sapling and third in the small sapling category. Beech was poorly represented in all sapling categories. Stinging nettle, Canada waterleaf, wild ginger, fragile fern, and violet were the most abundant herbaceous taxa with sugar maple, bladdernut, white ash, winged wahoo, and wild black cherry being the most abundant woody seedlings.

Southwest-Facing Slope (14 plots)

Sugar maple ranked first in importance value among overstory trees (IV=37.6), occurred in 85.7% of the plots, and accounted for 52.9% of the trees encountered. Hackberry ranked second in importance, occurring in 35.7% of the plots. White oak and red oak were the only other trees encountered with an importance value greater than 10. Beech was not well represented, having an importance value of 4.3 and occurring in only 2 plots.

Sugar maple had the highest density among the large and intermediate saplings and ranked second in density in the small sapling category. Beech was not encountered in the large sapling category and was poorly represented in the intermediate and small sapling categories. Pawpaw had the highest density in the small sapling category. Winged wahoo was the only shrub taxon encountered.

Groundlayer plots located on southwest-facing slopes were the most diverse, with 38 taxa being encountered, and had the highest density. Canada waterleaf, fragile fern, wild ginger, violet, stinging nettle, *Arisaema triphyllum* (L.) Schott. (Jack-in-the-pulpit), clearweed, and *Hybanthus concolor* (T.F. Frost) Spreng. (green violet) each had an importance value greater than 5.0. Sugar maple, white ash, wild black cherry, and pawpaw were the most abundant woody seedlings.

Endangered Species

A population of *Iresine rhizomatosa* Standl. (bloodleaf) was encountered during the study. *I. rhizomatosa* is a dioecious, rhizomatous perennial with a restricted range in Illinois, being confined to the drainage basins of the Wabash and Ohio Rivers (Gleason and Cronquist 1991, Herkert 1991, Mohlenbrock 1986). Other populations of this species in Illinois are located in floodplain areas that receive periodic inundation at some point during the year. The population at Robeson Hills consisted of several hundred stems growing in a colony that occupied an area approximately 6 m x 12 m. The colony was unusual in that it was observed at an elevation of 155 m, well above the 125 m elevation of the 100-year floodplain.

ACKNOWLEDGMENTS

The author wishes to thank Vincennes University and the Illinois Nature Preserves Commission for granting permission to conduct the study. Sincere appreciation is extended to Matt Bowyer, Illinois Department of Natural Resources, for his assistance in establishing the transect lines, to Dr. J. E. Ebinger and Tracey Edgin for their assistance with data collection, and to Amy Young for her assistance in the preparation of the manuscript.

LITERATURE CITED

Abrell, D. B. and M. T. Jackson. 1977. A decade of change in an old-growth beech-maple forest in Indiana. American Midland Naturalist 98:22—32.

Anderson, R. C. 1983. The eastern prairie-forest transition – an overview. pages 86—92 *in* R. Brewer (editor), Proceedings of the Eighth North American Prairie Conference, 1982, Western Michigan University, Kalamazoo.

Braun, E. L. 1950. Deciduous Forest of Eastern North America. Blakiston, Philadelphia, Pennsylvania.

Cowell, C. M. and M. T. Jackson. 2002. Vegetation change in a forest remnant of the eastern presettlement prairie margin, USA. Natural Areas Journal 22:53—60.

Donselman, H. M. 1973. An ecological analysis of the tree stratum of the beech-maple forest type. M. S. Thesis # 1299, Indiana State University, Terre Haute, Indiana.

Dunn, C. P. 1978. An ecological analysis of the tree stratum of the beech-maple forest type. M S. Thesis # 1299, Indiana State University, Terre Haute, Indiana.

Ebinger, J. E. 1997. Forest communities of the Midwestern United States. pages 3-23 *in* M. W. Schwartz (editor), Conservation in Highly Fragmented Landscapes, Chapman and Hall, New York.

Fehrenbacher, J. B. and R. T. Odell. 1956. Lawrence County Soils. Soil Report 78. University of Illinois Agricultural Experiment Station, Urbana, Illinois.

Gleason, H. A. and A. Cronquist. 1991. Manual of the vascular plants of northeastern United states and Adjacent Canada. New York Botanical Garden, Bronx, New York.

Herkert, J. R. editor. 1991. Endangered and threatened species of Illinois: Status and distribution, Volume I - Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 158 p.

Iverson, L. R., G. L. Rolfe, T. J. Jacob, A. S. Hodgins, and M. R. Jeffords. 1991. Forests of Illinois. Illinois Council on Forest Development, Urbana, and Illinois Natural History Survey, Champaign, Illinois.

Kuchler, A. W. 1964. Potential Natural Vegetation of the Coterminous United States. American Geographical Society Special Publications 36.

Levenson, J. B. 1973. The herbaceous stratum of the beech-maple forest: A community structure analysis. M. S. Thesis # 1088, Indiana State University, Terre Haute, Indiana.

Lindsey, A.A. 1955. Testing the line-strip method against full tallies in diverse forest types. Ecology 36:485—495.

McFall, D. and J. Karnes. editors, 1995. A Directory of Illinois Nature Preserves. Volume 2. Northwestern, Central, and Southern Illinois. Illinois Department of Natural Resources, Division of Natural Heritage, Springfield, Illinois.

Mohlenbrock, R. H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale, Illinois.

Poulson, T. L. and W. J. Platt. 1996. Replacement patterns of beech and sugar maple in Warren Woods, Michigan.

Rillo, T. J. 1978. Conceptual development plan for Robeson Hills. Department of Recreation and Park Administration, Indiana University, Bloomington, Indiana.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Springfield, Illinois. 32 Pages + map.

Shotola, S. J., G. T. Weaver, P. A. Robertson, and W. C. Ashby. 1992. Sugar maple invasion of an old-growth oak-hickory forest in Southwestern Illinois. American Midland Naturalist 127:125—138.

Swanson, A. M. and J. L. Vankat. 2000. Woody vegetation and vascular flora of an old-growth mixed mesophytic forest in southwestern Ohio. Castanea 65:36—55.

Taft, J. B., G. S. Wilhelm, D. M. Ladd, and L. A. Masters. 1997. Floristic quality assessment for vegetation in Illinois, a method for assessing vegetation integrity. Erigenia 15:1—95.

Weather.com. 2002. Monthly averages and records for Vincennes, Indiana. The Weather Channel.

Table 1. Density (trees/ha) by diameter classes (cm), total density, basal area (m^2/ha), frequency (%), relative density, relative dominance, relative frequency, importance value, and average dbh are given for tree taxa encountered during sampling of Robeson Hills Nature Preserve, Lawrence County, Illinois. Also included is the density (trees/ha), importance value and average dbh per tree taxa from the 1973 study. (Dunn 1978).

Species	10.0 -19.9	20.0 -29.9	30.0 -39.9	40.0 -49.9	50.0 -59.9	60.0 -69.9	70.0 -79.9	80.0+	Total Density (#/ha)	Basal Area (m^2/ha)	Freq. (%)	Rel. Den.	Rel. Dom.	Rel. Freq.	IV	Avg. dbh	1973 Density (#/ha)	1973 IV	1973 Avg. dbh
Acer saccharum	34.0	28.0	10.0	5.0	7.0	11.0	5.0	1.0	101.0	11.229	85.5	54.3	33.9	31.4	39.9	37.4	59.0	17.8	33.8
Fagus grandifolia	2.0	3.0	5.0	3.0	4.0	3.0	3.0	3.0	26.0	5.982	57.5	14.0	18.0	22.5	18.2	54.1	77.0	31.1	47.6
Celtis occidentalis	4.0	1.0	2.0	2.0	2.0	--	2.0	--	13.0	1.424	20.0	7.0	4.3	7.8	6.4	39.1	2.0	1.2	54.1
Liriodendron tulipifera	--	--	1.0	1.0	--	--	--	3.0	5.0	2.572	10.0	2.7	7.8	4.0	4.8	80.7	4.0	3.1	77.4
Quercus alba	--	1.0	--	1.0	2.0	--	--	2.0	6.0	2.043	7.5	3.2	6.1	2.9	4.1	65.8	9.0	5.8	68.6
Quercus rubra	--	--	--	--	--	--	--	3.0	3.0	2.243	7.5	2.2	6.8	2.9	3.8	84.5	8.0	6.5	82.1
Platanus occidentalis	--	--	--	--	--	--	--	3.0	3.0	2.310	7.5	1.6	7.0	2.9	3.8	99.0	1.0	0.6	56.4
Fraxinus americana	--	--	--	1.0	1.0	1.0	1.0	1.0	5.0	1.810	7.5	2.7	5.5	2.9	3.7	67.7	4.0	2.3	55.3
Carya glabra	--	1.0	--	1.0	--	1.0	--	1.0	4.0	1.103	10.0	2.2	3.3	4.0	3.2	59.7	4.0	4.3	52.9
Juglans nigra	--	--	2.0	--	1.0	--	--	--	3.0	0.424	7.5	1.6	1.3	2.9	1.9	42.2	1.0	0.4	15.9
Carpinus caroliniana	4.0	--	--	--	--	--	--	--	4.0	0.068	7.5	2.2	0.2	2.9	1.8	15.9	1.0	0.4	11.3
Ulmus americana	2.0	1.0	--	--	--	--	--	--	3.0	0.057	7.5	1.6	0.2	2.9	1.6	15.9	9.0	3.7	29.8
Fraxinus pennsylvanica	--	--	--	--	--	2.0	--	--	2.0	0.598	5.0	1.1	1.8	2.0	1.6	61.8	1.0	0.6	51.7
Gymnocladus dioica	2.0	--	--	--	--	--	--	--	2.0	0.041	5.0	1.1	0.1	2.0	1.1	15.9	3.0	1.7	54.1
Quercus macrocarpa	--	--	--	--	--	--	1.0	--	1.0	0.434	2.5	0.5	1.3	1.0	0.9	74.0	1.0	0.6	51.7
Carya tomentosa	--	--	--	--	--	1.0	--	--	1.0	0.345	2.5	0.5	1.0	1.0	0.8	66.8	1.0	0.5	11.8
Acer rubrum	--	--	--	--	--	1.0	--	--	1.0	0.295	2.5	0.5	0.9	1.0	0.8	61.8	--	--	--
Tilia americana	--	--	1.0	--	--	--	--	--	1.0	0.112	2.5	0.5	0.3	1.0	0.6	37.4	6.0	2.4	45.1
Asimina triloba	1.0	--	--	--	--	--	--	--	1.0	0.017	2.5	0.5	0.1	1.0	0.6	15.9	--	--	--
Carya ovata	1.0	--	--	--	--	--	--	--	1.0	0.037	2.5	0.5	0.1	1.0	0.5	19.9	16.0	6.7	35.6
Others (7 species)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26.0	10.3	--
Totals	50.0	35.0	21.0	14.0	17.0	20.0	12.0	17.0	186.0	33.144	--	100.0	100.0	100.0	100.0	--	233.0	100.	

Table 2. Density (stems/ha), frequency (%), relative density, relative frequency, and importance value for large saplings (≥ 5.0 cm dbh - 9.9 cm dbh), intermediate saplings (≥ 2.5 cm dbh - ≤4.9 cm dbh), and small saplings (≥50 cm tall - ≤2.4 cm dbh) encountered during sampling of Robeson Hills Woods Nature Preserve, Lawrence County, Illinois.

Large Saplings (5.0—9.9 cm dbh)

	Density (stem/ha)	Freq. (%)	Rel. Den.	Rel. Freq.	IV
Acer saccharum	80	35.0	51.6	63.6	57.6
Prunus serotina	40	10.0	25.8	18.1	21.9
Carpinus caroliniana	20	5.0	12.9	9.1	11.0
Cornus florida	10	2.5	6.5	4.6	5.6
Carya cordiformis	5	2.5	3.2	4.6	3.9
Totals	155		100.0	100.0	100.0

Intermediate Saplings (2.5—4.9 cm dbh)

Acer saccharum	225	62.5	71.3	65.8	68.5
Asimina triloba	45	17.5	14.3	18.4	16.4
Celtis occidentalis	15	5.0	4.8	5.3	5.0
Carpinus caroliniana	10	5.0	3.2	5.3	4.3
Fagus grandifolia	15	2.5	4.8	2.6	3.7
Tilia americana	5	2.5	1.6	2.6	2.1
Totals	315		100.0	100.0	100.0

Small Saplings (>50 cm tall - 2.4 cm dbh)

Asimina triloba	4160	95.0	80.6	37.3	59.0
Acer saccharum	645	77.5	12.5	30.4	21.5
Fagus grandifolia	95	30.0	1.8	11.8	6.8
Celtis occidentalis	70	10.0	1.4	3.8	2.6
Tilia americana	25	10.0	0.5	3.8	2.2
Carya cordiformis	30	7.5	0.6	2.9	1.8
Ulmus rubra	50	5.0	1.0	2.0	1.5
Carpinus caroliniana	10	5.0	0.2	2.0	1.1
Fraxinus americana	15	5.0	0.3	2.0	1.1
Gymnocladus dioica	40	2.5	0.8	1.0	0.9
Liriodendron tulipifera	5	2.5	0.1	1.0	0.5
Carya glabra	5	2.5	0.1	1.0	0.5
Fraxinus americana	5	2.5	0.1	1.0	0.5
Totals	5155		100.0	100.0	100.0

Table 3. Density (stems/ha) arranged by aspect, total density (stems/ha), frequency (%), relative density, relative frequency, and importance value for shrubs encountered during sampling of Robeson Hills Woods Nature Preserve, Lawrence County, Illinois.

	Density (stem/ha)	Freq. (%)	Rel. Den.	Rel. Freq.	IV
Staphylea trifolia	295	5.0	85.6	18.2	51.9
Sambucus canadensis	15	7.5	4.3	27.2	15.8
Euonymus alata	15	5.0	4.3	18.2	11.3
Lindera benzoin	10	5.0	2.9	18.2	10.5
Rosa multiflora	10	5.0	2.9	18.2	10.5
Totals	345	27.5	100.0	100.0	100.0

Table 4. Density (stems/ha) arranged by aspect and total density (stems/ha), frequency (%), relative density, relative frequency, and importance value for ground layer taxa encountered during sampling of Robeson Hills Woods Nature Preserve, Lawrence County, Illinois.

Species	Total Density (stem/ha)	Freq. (%)	Rel. Den.	Rel. Freq.	IV
Hydrophyllum canadense	95100	72.5	28.55	10.0	19.4
Laportea canadensis	108700	40.0	32.63	5.5	19.2
Asarum canadense	28500	50.0	8.57	6.9	7.9
Cystopteris protrusa	25300	45.0	7.58	6.3	7.0
Acer saccharum	15100	60.0	4.54	8.3	6.4
Viola spp.	12000	45.0	3.61	6.3	5.0
Fraxinus americana	5900	57.5	1.78	7.9	4.9
Arisaema triphyllum	6800	37.5	2.05	5.1	3.6
Asimina triloba	3100	37.5	0.93	5.1	3.0
Prunus serotina	2900	32.5	0.87	4.5	2.7
Parthenocissus quinquefolius	2800	27.5	0.84	3.8	2.3
Phlox divaricatus	3100	22.5	0.93	3.1	2.0
Impatiens capensis	4100	15.0	1.23	2.1	1.7
Ulmus rubra	1400	20.0	0.42	2.7	1.6
Carya cordiformis	800	17.5	0.24	2.4	1.3
Polygonum virginianum	1600	12.5	0.48	1.7	1.1
Pilea pumila	4100	5.0	1.24	0.7	1.0
Quercus alba	600	12.5	0.18	1.7	1.0
Agrostis hyemalis	1300	10.0	0.39	1.4	0.9
Vitis spp.	500	10.0	0.15	1.4	0.8
Staphylea trifolia	1800	5.0	0.54	0.7	0.6
Liriodendron tulipifera	300	7.5	0.09	1.0	0.6
Solidago caesia	1900	5.0	0.27	0.7	0.5
Athyrium pycnocarpon	1100	5.0	0.33	0.7	0.5
Carex spp.	700	5.0	0.21	0.7	0.5
Others (23 taxa)	4500	72.5	1.35	9.3	4.5
Totals	334000		100.0	100.0	100.0

Table 5. Ranking of tree species by importance value for plots that occurred on 2 slope aspects at Robeson Hills Nature Preserve, Lawrence County, Illinois. The species listed are those with the 10 highest overall importance values throughout the preserve and are arranged in descending importance value. Ranking of the taxa by importance value for each slope is in parenthesis.

	Aspect	
Species	Northeast (16 plots)	Southwest (14 plots)
Acer saccharum	43.8 (1)	37.6 (1)
Fagus grandifolia	19.7 (2)	4.3 (7)
Celtis occidentalis	2.9 (5)	11.9 (2)
Liriodendron tulipifera	11.8 (3)	--- ---
Quercus alba	— ---	11.4 (3)
Quercus rubra	--- ---	10.9 (4)
Platanus occidentalis	2.8 (6)	3.6 (8)
Fraxinus americana	2.6 (7)	8.3 (5)
Carya glabra	2.1 (8)	6.5 (6)
Juglans nigra	3.3 (4)	--- ---

Appendix I

ANNOTATED SPECIES LIST

The vascular flora of Robeson Hills Nature Preserve and Land and Water Reserve is arranged alphabetically within each taxonomic group. Nonnative taxa are indicated by an asterisk (*). Collection numbers are those of Edgin.

PTERIDOPHYTA

ADIANTACEAE
Adiantum pedatum L.

ASPLENIACEAE
Asplenium platyneuron (L.) Oakes; E3355
Athyrium pycnocarpon (Spreng.) Tidestrom; E2041
Cystopteris protrusa (Weatherby) Blasd.; E2047
Polystichum acrostichoides (Mchx.) Schott.; E2066
Woodsia obtusa (Spreng.) Torrey; E3360

EQUISETACEAE
Equisetum arvense L.; E3357
Equisetum hyemale L. var. *affine* (Engelm.) A. A. Eaton; E3091

OPHIOGLOSSACEAE
Botrychium dissectum Spreng.; E3849
Botrychium dissectum Spreng. var. *obliguum* (Muhl.) Clute; E3848
Botrychium virginianum (L.) Sw.; E3352
Ophioglossum vulgatum L. var. *pseudopodum* (Blake) Farw.; E3356

GYMNOSPERMAE

CUPRESSACEAE
Juniperus virginiana L.; E3350

ANGIOSPERMAE

MONOCOTYLEDONAE

ARACEAE
Arisaema triphyllum (L.) Schott.; E2042
Arisaema dracontium (L.) Schott.; E5491

COMMELINACEAE
Tradescantia subaspera Ker.; E3056

CYPERACEAE
Carex albursina Sheldon; E2034
Carex blanda Dewey; E2072
Carex frankii Kunth; E3074
Carex grayi Carey; E3059
Carex grisea Wahl.; E3583
Carex jamesii Schwein.; E2024
Carex pensylvanica Lam. E3196
Carex rosea Willd.; E2065
Carex vulpinoidea Mchx.; E3582
Scirpus cyperinus (L.) Kunth; E5492

DIOSCOREACEAE
Dioscorea quaternata (Wait.) J. F. Gmel.; E3058

LILIACEAE
Erythronium albidum Nutt. E3194
Polygonatum commutatum (Schult.) A. Dietr.; E4981
Smilacina racemosa (L.) Desf; E3347
Trillium flexipes Raf.; E2027
Trillium recurvatum Beck; E2051
Trillium sessile L.; E2039
Uvularia grandiflora Sm.; E2029

ORCHIDACEAE
Aplectrum hyemale (Willd.) Nutt.; E3859
Galearis spectabilis (L.) Raf.
Liparis lilifolia (L.) Rich.; E4984
Spiranthes cernua (L.) Rich.; E3807

POACEAE
Bromus pubescens Muhl.; E3585
Cinna arundinacea L.; E3854
Diarrhena americana Beauv.; E3588
Elymus hystrix L.; E3046
Elymus villosus Muhl.; E3083
Elymus virginicus L.; E3066
Festuca obtusa Biehler; E3587
Glyceria striata (Lam.) Hitchc.; E3567
Leersia lenticularis Michx.; E5494
Leersia virginica Willd.; E3069A
Poa sylvestris Gray; E2073

SMILACACEAE
Smilax hispida Muhl.; E3082

DICOTYLEDONEAE

ACANTHACEAE
Ruellia strepens L.; E3096

ACERACEAE
Acer negundo L.; E3815
Acer saccharinum L.; E3823
Acer saccharum Marsh.; E2061

AMARANTHACEAE
Iresine rhizomatosa Standley; E3053

ANACARDIACEAE
Toxicodendron radicans (L.) Kuntze;E4982

ANNONACEAE
Asimina triloba (L.) Dunal; E2060

APIACEAE
Cryptotaenia canadensis (L.) DC.; E3081
**Daucus carota* L.; E5496
Erigenia bulbosa (Michx.) Nutt.:E5497
Osmorhiza claytonii (Michx.) Clarke; E5498
Osmorhiza longistylis (Toffey) DC.; E2046
Sanicula canadensis L.; E3577
Sanicula gregaria Bickn.; E3054

ARALIACEAE
Panax quinquefolius L.; E3575

ARISTOLOCHIACEAE
Asarum canadense L. var. *reflexum* (Bickn.) Robins.; E2045

ASTERACEAE
Aster pilosus Willd; E3822
Aster lateriflorus (L.) Britt.; E3845
Aster novae-angliae L.; E3852
Aster x *sagittifolius* Wedem.; E3863
Bidens aristosa Mchx.; E3868
Cirsium discolor (Muhl.) Spreng.; E3819
Elephantopus carolinianus Raeusch.; E3077
Erigeron annuus (L.) Pers.; E3055
Erigeron philadelphicus L.; E3351
Eupatorium coelestinum L.; E5499
Eupatorium purpureum L.; E3088
Eupatorium rugosum ffoutt.; E3075
Eupatorium serotinum Michx.; E3821
Helianthus strumosus L.; E3867
Lactuca floridana (L.) Gaertn.; E3834
Prenanthes altissima L.; E3813
Rudbeckia laciniata L.; E5500
Senecio glabellus L.; E4989
Solidago caesia L.; E3865
Solidago canadensis L.; E3850
Solidago flexicaulis L.; E3080
Solidago ulmifolia Muhl.; E3825
Verbesina alternifolia (L.) Britt.; E3094
Vernonia gigantea (Wait.) Trel.; E3851

BALSAMINACEAE
Impatiens capensis Meerb.; E3062
Impatiens pallida Nutt.; E3061

BERBERIDACEAE
**Berberis thunbergii* DC.; E3346
Podophyllum peltatum L.; E2036

BIGNONIACEAE
Campsis radicans (L.) Seem.; E3569

BORAGINACEAE
Hackelia virginiana (L.) I. M. Johnston; E3095
Mertensia virginica (L.) Pers.; E2031
Myosotis macrosperma Engelm.; E2069

BRASSICACEAE
Cardamine bulbosa (Schreb.) BSP.; E5502
Cardamine douglassii (Torr.) Britt.; E2044
**Cardamine hirsuta* L.:E2033
Dentaria laciniata Muhl.: E2053
**Rorippa sylvestris* (L.) K. Koch; E3574

CAESALPINIACEAE
Cercis canadensis L.; E2034
Gymnocladus dioica (L.) K. Koch: E3574

CAMPANULACEAE
Campanula americana L.; E3071
Lobelia inflata L.; E3808

CAPRIFOLIACEAE
**Lonicera japonica* Thunb.: E3847
**Lonicera maackii* (Rupr.) Maxim.: E3838
Sambucus canadensis L.; E3824
Symphoricarpos orbiculatus Moench.; E3841

CARYOPHYLLACEAE
Silene stellata (L.) Ait.; E3812
**Stellaria media* (L.) Vill.; E4985

CELASTRACEAE
**Euonymus alata* (Thunb.) Sieb.; E2071
Euonymus atropurpurea Jacq.; E3070
**Euonymus europaea* L.; E5504

CHENOPODIACEAE
Chenopodium album L.; E3860

CONVOLVULACEAE
Ipomoea pandurata (L.) G. F. W. Mey.; E5505

CORNACEAE
Cornus drummondii C. A. Mey.; E3833
Cornus florida L.; E3826

CORYLACEAE
Carpinus caroliniana Walt.; E3837
Corylus americana Walt.; E3831
Ostrya virginiana (Mill) K. Koch; E2070

EBENACEAE
Diospyros virginiana L.; E3827

ELAEAGNACEAE
**Elaeagnus umbellata* Thunb.; E3836

EUPHORBIACEAE
Acalypha rhomboidea Raf.; E3842

FABACEAE
Desmodium cusipidatum (Muhl.) Loud.; E5506
Desmodium nudiflorum (L.) DC.; E5507

FAGACEAE
Fagus grandifolia Ehrh.; E3855
Quercus alba L.; E3579
Quercus bicolor Willd.; E5508
Quercus macrocarpa Michx.; E5510
Quercus pagoda Raf; E3586
Quercus prinoides Wild. var. *acuminata* (Michx.) Gl.; E3067
Quercus rubra L.; E3811
Quercus velutina Lam.; E5509

GENTIANACEAE
Frasera carolinensis Walt.; E5511

GERANIACEAE
Geranium maculatum L.; E3348

HYDROPHYLLACEAE
Hydrophyllum appendiculatum Michx.; E4986
Hydrophyllum canadense L.; E3580
Hydrophyllum virginianum L.; E4986
Phacelia purshii Buckley

HYDRANGEACEAE
Hydrangea arborescens L.; E3578

HYPERICACEAE
Hypericum mutilum L.; E5515

JUGLANDACEAE
Carya cordiformis (Wang.) K. Koch ; E5516
Carya glabra (Mill.) Sweet; E3576
Carya ovata (Mill.) K. Koch; E5517
Carya tomentosa (Poir.) Nutt.; E5518
Juglans nigra L.; E 5519

LAMIACEAE
Agastache nepetoides (L.) Ktze.; E3060
Blephilia hirsuta (Pursh.) Benth., E3065, E3584
**Lamium purpureum* L. E3195
**Perilla frutescens* (L.) Britt; E3814
**Prunella vulgaris* L.; E3818
Scutellaria ovata var. *versicolor* (Nutt.) Fernald; E3049
Stachys tenuifolia Willd; E3063
Teucrium canadense L. var. *virginicum* (L.) Eat.; E3844

LAURACEAE
Lindera benzoin (L.) Blume; E30 51
Sassafras albidum (Nutt.) Nees; E3830

MAGNOLIACEAE
Liriodendron tulipifera L.; E3568

MENISPERMACEAE
Menispermum canadensis L.; E2068

MORACEAE
**Maclura pomifera* (Raf.) Schnieder; E5520
Morus rubra L.; E3866

NYSSACEAE
Nyssa sylvatica Marsh.; E5521

OLEACEAE
Fraxinus americana L.; E3856
Fraxinus pennsylvanica Marsh.; E3820

ONAGRACEAE
Circaea lutetiana Aschers. & Magnus spp. *canadensis* (L.) Aschers. & Magnus; E3571
Oenothera biennis L.; E3853

OROBANCHACEAE
Epifagus virginiana (L,) Bart.: E3857

OXALIDACEAE
Oxalis dillenii Jacq.; E3857
Oxalis stricta L.; E3573
Oxalis violacea L.; E5522

PAPAVERACEAE
Dicentra cucullaria (L.) Bernh.; E2048
Sanguinaria canadensis L.; E2030

PHRYMACEAE
Phryma leptostachya L.; E3093

PHYTOLACCACEAE
Phytolacca americana L.; E3084

PLATANACEAE
Platanus occidentalis L.; E3816

POLEMONIACEAE
Phlox divaricata L.; E2049
Phlox paniculata L.; E3064
Polemonium reptans L.; E2035

POLYGONACEAE
**Polygonum cespitosum* Blum var. *longisetum* (DeBruyn) Stewart; E3862
**Polygonum hydropiper* L.; E3085
Polygonum punctatum Ell.; E5523
Polygonum scandens L.; E3810
Polygonum virginianum L.; E3073

PORTULACACEAE
Claytonia virginica L.; E2054

RANUNCULACEAE
Actaea pachypoda Ell.; E3362
Anemone canadensis L.; E5524
Delphinium tricorne Michx.; E2052
Isopyrum biternatum (Raf) T. & G.; E2038
Ranunculus abortivus L.; E4988
Ranunculus micranthus Nutt.; E2032
Ranunculus recurvatus Poir.; E3061
Ranunculus septentrionalis Poir.; E2028

ROSACEAE
Agrimonia pubescens Wallr.; E3068
Amelanchier arborea (Mchx. F.) Fern.; E5526
Geum canadense Jacq.; E3076
Geum vernum (Raf) T. & G.; E2067
Prunus serotina Ehrh.; E3858
Rosa carolina L.; E5527
**Rosa multiflora* Thunb.; E2057

RUBIACEAE
Galium aparine L.; E3358
Galium circaezans Michx.; E3092
Galium concinnum T. & G.; E3089B
Galium triflorum Michx.; E3090

SALICACEAE
Populus deltoides Marsh.; E5741
Salix nigra Marsh.; E5740

SCROPHULARIACEAE
Mimulus alatus Ait.; E3069B

SIMAROUBACEAE
Ailanthus altissima (Mill.) Swingle; E3087

SOLANACEAE
Solanum ptycanthum Dunal.; E3048

STAPHYLACEAE
Staphylea trifolia L.; E3193

TILIACEAE
Tilia americana L.; E2058

ULMACEAE
Celtis laevigata Willd.; E3050
Celtis occidentalis L.; E3864
Ulmus americana L.; E3843
Ulmus rubra Muhl.; E3828

URTICACEAE
Boehmeria cylindrica (L.) Sw.; E3822
Laportea canadensis (L.) Wedd.; E3861
Pilea pumila (L.) Gray; E3079

VERBENACEAE
Verbena hastata L.
Verbena urticifolia L.; E3086

VIOLACEAE
Hybanthus concolor (T.F. Frost) Spreng.; E3047
Viola pratincola Greene; E3353
Viola pubescens var. *eriocarpa* (Schwein.) Russell; E2050
Viola sororia Willd.; E2040
Viola striata Ait.; E3354

VITACEAE
Ampelopsis cordata Michx.; E3566
Parthenocissus quinquefolia (L.) Planch.; E2055
Vitis aestivalis Michx.; E3829
Vitis vulpina L.; E3839

ERIGENIA, Number 19, September 2003, pp. 31—51

TWENTY-YEAR WOODY VEGETATION CHANGES IN NORTHERN FLATWOODS AND MESIC FOREST AT RYERSON CONSERVATION AREA, LAKE COUNTY, ILLINOIS

Marlin Bowles[1], Michael Jones[2], Christopher Dunn[1], Jenny McBride[1], Charles Bushey[3], and Robbin Moran[4]

ABSTRACT: Conservationists are concerned that forest fragmentation and fire suppression are causing an increase in shade-tolerant species (e.g., maples) and a decline of fire-adapted oaks and associated species richness in midwestern forests. We tested whether such changes are occurring in flatwoods and mesic forest stands that were first sampled in 1975—1976 at the Ryerson Conservation Area in Lake County, Illinois. We re-sampled tree and shrub plots in these stands in 1997 and compared their changes over time. In 1976, the northern flatwoods was dominated by swamp white oak and white oak in large size classes, and by ash in small size classes. By 1977, these species had increased in stem numbers, resulting in a 23% increase in basal area. However, a large decline took place among mid-size oaks and shrub layer species over the 20-year period. Sugar maple dominated the mesic forest stand, where it increased in importance and now dominates all but the largest size class, which is oak-dominated. However, there was little gain in larger size classes, and basal area decreased 28%. Maples also increased in smaller size classes, whereas shrub layer species and mid-size class oaks and maples declined. Shrub layer stem density and species richness were much higher in flatwoods than in mesic forest, and a native species richness index also showed the northern flatwoods' groundlayer to be more than twice as rich as the mesic forest. Tree cores indicate that declining mid-size class trees arose in the late 1800s, while older age class oaks and maples predate settlement. The changes in flatwoods are apparently due to forest canopy maturation and canopy closure, a process that probably began with fire protection after European settlement. Decline of oaks in the mesic forest may be less closely linked with fire protection, and the increase in maple saplings might have been triggered by more recent loss of canopy elms. Over-browsing by eastern white-tailed deer could have enhanced the decline of shrubs in both stands. The trends of increasing ash and maples in these stands indicate that they will become less diverse unless management can restore canopy structure that will maintain shrub layer species and allow oak regeneration. Restoration goals and applied research are needed to guide recovery. Fire appears to be the principal tool, especially in flatwoods, but it may have positive and negative effects, and supplemental cutting of fire-resistant vegetation may be required.

INTRODUCTION AND PROBLEM

Replacement of fire-adapted oak (*Quercus*) species by shade-tolerant and fire-intolerant species such as sugar maple (*Acer saccharum*) is often characteristic of fire-protected midwestern forests (McIntosh 1957, Curtis 1959, Schlesinger 1976, Miceli et al. 1977, Lorimer 1985, Pallardy et al. 1991, Abrams 1992, Roovers and Shifley 1997). During this process, forest stand maturation and canopy closure decrease canopy light penetration, thereby preventing oak reproduction and lowering tree species diversity (Christensen 1977, Lorimer 1984, McGee 1986). These successional changes are thought to be occurring in oak forests of the Chicago region, but have not been well documented (Bowles et al. 2000). We tested for such changes in a northern flatwoods and a mesic forest stand at the Ryerson Conservation Area, Lake County, Illinois. These stands were identified and sampled by the Illinois Natural Areas Inventory (INAI) in 1976 and were found to represent old second-growth stand structure. The Ryerson mesic stand was also sampled independently in 1975, providing additional data. Our objectives were 1) to compare successional changes in these stands, 2) to describe the chronology and potential causes for the changes, and 3) to discuss management and restoration objectives.

STUDY AREAS

Landscape context

The Ryerson Conservation Area lies on the east side of the Des Plaines River, in Sec. 23, 25, and 26, T43N, R11E, and is located in the Western Morainal Section of the Morainal Natural Division (Swink and Wilhelm 1994). In this area in 1976, the Illinois Natural Areas Inventory (INAI) identified 329 acres of high-quality mesic floodplain forest, dry-mesic and mesic upland forest, and northern flatwoods. These forests were protected from eastward-moving prairie fires by the Des Plaines River, resulting in a transition from forest nearest the river to woodland, savanna and then prairie to the east (Figure 1). The

[1]The Morton Arboretum, Lisle, Illinois; [2]Christopher Burke Engineering, Rosemont, Illinois;
[3]Montana Prescribed Fire Services, Billings, Montana; [4]The New York Botanic Garden, Bronx, New York

frequency and intensity of presettlement fires that occurred across this gradient are poorly understood. The mesic floodplain was one of the most fire-protected forest habitats of the Chicago region, which allowed development of presettlement maple-basswood forest (Moran 1978), and the extent to which this forest may have burned is unknown.

Historic vegetation

Northern flatwoods occur on seasonally wet, impervious glacial till. This vegetation type is often dominated by swamp white oak (*Quercus bicolor*) and is thought to have been savanna or woodland prior to settlement (White and Madany 1978). The flatwoods stand at Ryerson was located in presettlement woodland (Figure 1), in which the Public Land Survey recorded "bur oak," "white oak," and "white ash" witness trees at a mean density of 52 trees/ha, and woody undergrowth of "elm," "white ash," "pin oak," and "hickory" (PLS data from east line of Sec. 25). In 1976, the INAI found the flatwoods stand at Ryerson dominated by *Q. bicolor,* with lower abundance of *Q. alba* and Hill's oak (*Q. ellipsoidalis*). Nomenclature follows Swink and Wilhelm (1994), which treats *Q. ellipsoidalis* as scarlet oak (*Q. coccinea*).

The Ryerson mesic stand occupies a river floodplain terrace in which the Public Land Survey recorded a single maple witness tree and undergrowth of "lynn" (basswood), "hickory" and "maple." Tree density could not be calculated because the tree was apparently located directly on the quarter corner (PLS data from north line of Sec. 25). In 1976, the stand was *Acer saccharum*-dominated with subdominance by red elm (*Ulmus rubra*) and red oak (*Quercus rubra*); however, a large amount of American elm (*U. americana*) was lost from the canopy of this stand in the 1960s due to Dutch elm disease (C. Bushey pers. obs.). The Ryerson Conservation Area was also grazed to some extent by horses and cattle in the past, and more recently, its ground layer vegetation has been severely impacted by browsing of eastern white-tailed deer (Anderson 1994). The area is managed by the Lake County Forest Preserve District.

METHODS

Historic data collection

In 1976, the INAI sampled the flatwoods and mesic stands with nested tree and shrub plots at 20 sampling points equally spaced along two randomly located transect lines (Table 1). These transects were not permanently marked, but their locations were traced on aerial photo overlays. Overstory tree sampling included tree species basal area (BA) with a 3-BA factor metric wedge prism, and a tally of trees > 1 dm dbh (diameter at 1.37 meter high) by 1-dm size class from circular 0.025 hectare plots. Woody understory sampling included density of shrubs and tree saplings > 1m high but < 1 dm dbh in ten circular 0.001 hectare plots at alternating sampling points. These methods compromise calculation of BA because wedge prism counts are biased toward larger trees, and dbh was recorded by size class rather than actual diameter.

In 1975, C. Bushey and R. Moran sampled the Ryerson mesic stand with 68 square 0.01-hectare (100m^2) plots (Table 1). Their sampling transects were not permanently marked, but locations were mapped. The sampling plots were equally spaced along one ~200-meter north-south transect and along three parallel ~350-meter east-west transects. Within each plot, all trees ≥ 10cm dbh were identified and measured for exact dbh. All tree saplings < 10 cm dbh in each plot were identified and placed in either 2.5 - < 6.2 cm dbh or 6.2 - < 10 cm dbh size classes.

Data collection in 1997

All new sampling transects were located as precisely as possible based on original maps and marked with conduit stakes. To resample using similar methods to the INAI, tree dbh was measured in each of the twenty 0.025 ha circular plots and assigned to 1-dm size classes. Shrub and sapling densities were recorded from all 20 sampling points in the 0.001 ha circular plots. We also sampled ground layer woody and herbaceous species presence and estimated their cover in 1 m^2 plots at each of the sampling points. Because of intergradation between bur oak (*Q. macrocarpa*) and *Q. bicolor* (Swink and Wilhelm 1994), and difficulty in separating immature *Fraxinus americana* and *F. pennsylvanica,* these species were combined into *Q. bicolor* and *Fraxinus* sp, respectively, for flatwoods data analysis. To replicate the data set collected by Bushey and Moran in the mesic stand in 1975, we sampled 68 circular 0.01-hectare plots (radius = 5.64 m) along the relocated transect lines. As in 1975, all trees ≥ 10 cm dbh were identified and measured for exact dbh within each plot, and saplings were placed in either 2.5 - < 6.2 cm dbh or ≥ 6.2—10 cm dbh size classes.

To establish tree cohort chronologies, tree cores were taken from *Quercus alba* and *Q. bicolor* in the flatwoods and from *Acer saccharum* and *Q. rubra* in the mesic stand. Because of limited numbers of smaller size class oaks, these species were supplemented with cores from similar habitats elsewhere in the Chicago region (Bowles et al. 2000).

Woody vegetation data analysis

For northern flatwoods, we compared our 1997 sampling data with the INAI 1976 data. Following Bowles et al. (2000), basal area was calculated by using the midpoint of each 1-dm size class in which a tree was tallied to estimate its stem radius (r) for the formula BA/ha = (πr^2) x (stems/ha). Importance values (IV) were calculated for each species as IV = ½ Σ (relative BA + relative density). Changes in structure were determined by comparing between years the BA and number of stems sampled by size class for all tree species. For shrub layer species, we compared the mean number of stems and species present per plot for each stand between 1976 and

1997 with t-tests. We also partitioned shrub layer species into three groups comparing true shrubs, understory trees, and tree saplings that represent potential canopy trees. We tested for proportional changes in stem densities among these species groups using Chi-square analysis in contingency tables.

For the mesic stand, we compared our 1997 data with the Bushey-Moran 0.01 ha plot data to determine change in tree species density, frequency, BA, and importance values, where IV = 1/3 Σ (relative density + relative frequency + relative BA). For these data, actual BA was calculated based on tree dbh values, where BA = (πr^2) x (stems/ha). We also used size class medians to estimate BA as a comparison with actual measures. We combined INAI and Bushey-Moran data for comparing changes in tree density by size class, providing the largest possible data set for this measure. For saplings, we compared temporal differences in stem densities in the 2.5 - < 6.2 cm dbh and the ≥ 6.2—10 cm dbh size classes. For shrub layer species, we compared the mean number of stems and species present per plot for each stand between 1976 and 1997 with t-tests.

Tree ring analysis

Ages of tree species based on tree ring counts were regressed against corresponding tree diameters (including bark), using linear regression and power functions. No oaks were available to provide ring counts for the 1 - < 2 dm size class. To compensate, one age-diameter correlate was randomly selected from the inner 5 cm core length of each core and added to the data set. Although bark thickness was not included, it would be negligible at this small size class. Power functions provided the best fit for *Quercus alba* and *Q. bicolor* in flatwoods, while linear regressions had the best fit for *Acer saccharum* and *Q. rubra* from mesic stands. More precise aging would require the number of years for trees to achieve tree-coring height under forest conditions. This is probably up to 10 years or more for oaks (G. Ware, pers. comm..) and longer for *A. saccharum,* which can persist in the shrub layer for at least 30 years (Hett 1971, Marks and Gardescu 1980).

Ground layer data analysis

For ground layer vegetation, frequencies and mean cover/m^2 were calculated, and species were ranked by their importance value, where IV = ½ Σ (relative frequency + relative cover), within the alien, graminoid, herbaceous, and woody species groups. We also calculated Species Richness Index (SRI) values for the flatwoods and mesic stands following Bowles et al. (2000). To derive the SRI, mean plot richness of all species ($\bar{x}$ R) was calculated by averaging the number of species per plot across all plots. The SRI is calculated as: [SRI = $\bar{x}$ R x *Ln*S], where *Ln*S = the natural logarithm of the total number of all species sampled. The Native Richness Index (NRI) uses mean plot richness of native species ($\bar{x}$ R_N), and is calculated as [NRI = $\bar{x}$ R_N x *Ln*NR] where *Ln*NR = natural logarithm of the total number of native species sampled. The difference between SRI and NRI reflects the Alien Component (AC) of species richness.

RESULTS

Northern flatwoods

Basal area in flatwoods increased from 20.5 to 26.6 m^2/ha (stand data are in Appendices). *Quercus bicolor,* the dominant species, increased in importance, whereas *Quercus alba* and *Q. coccinea* declined. Total stand density increased from 248 to 286 stems/ha, primarily due to a 100% increase in the smallest size class from *Fraxinus* sp., *F. nigra,* and *Ulmus americana,* as well as *Acer saccharum* and basswood (*Tilia americana*) (Figure 3). In contrast, stem numbers dropped in the 2 - < 4 dm size classes due, almost exclusively, to decline in *Quercus* species. In 1976, peak distributions occurred in the 2 - < 3 dm size class for *Q. alba* and the 3 - < 4 dm size class for *Q. bicolor* and *Q. coccinea.* Based on tree age-dbh regressions, these size classes correspond to cohorts that arose in about 1880—1890, with slower growth for *Q. alba* [age = 4.4839 * $diam.^{(.9114)}$] than for *Q. bicolor* [age = 2.8488 * $diam.^{(.9752)}$]. After 20 years, these cohorts appear to have shifted to larger size classes, with about 50% loss of stem numbers and essentially no recruitment in the smaller size class (Figure 3). This also resulted in a substantial shift in BA toward larger size classes (Figure 4). The oldest trees sampled in 1997 were *Q. bicolor* in the 8—9 dm size class that appears to have originated in about 1780.

In the flatwoods shrub layer, 15 species were sampled in 1976, with a density of 13,100 stems/ha. By 1997, stem density and species richness had declined significantly, with a proportionally greater decline in shrubs than trees (Figure 5). American hazelnut (*Corylus americana*), the dominant shrub, dropped 97% from 3700 stems/ha in 1976 to 100 stems/ha in 1997. Blue beech (*Carpinus caroliniana*), the most abundant small tree, dropped from 4100 to 2850 stems/ha, and saplings of *Fraxinus* sp and *Ulmus* sp dropped from 2000 to 300 stems/ha.

The flatwoods ground layer sample included 61 native species. *Potentilla simplex* was the most important species, followed in importance by *Geum canadensis, Galium aparine,* and *Carpinus caroliniana.* Native plot richness averaged 9.30 species, with a Native Richness Index of 33.38, and no alien species were sampled (Figure 6). Herbaceous species dominated the ground layer, but woody species accounted for 25% importance (Figure 6).

Mesic forest

Basal area in mesic forest at Ryerson decreased from 34.3 to 25.6 m^2/ha, with overall stand density dropping from 300 to 283.8 stems/ha. The estimate of BA based on size-class midpoints was in close agreement with BA calculated from actual dbh data, showing a 28.2% decline from 33.9 to 24.4 m^2/ha, which occurred across all but the two smallest size classes (Figure 4). *Acer saccharum,* the

single dominant tree, declined in BA, but increased in IV as almost all other tree species declined in importance (Figure 2). *Ulmus rubra*, primarily an understory species, remained the second most important species, while *Quercus rubra*, a canopy species, remained the third most important species. *Fraxinus americana* was the fourth most important species in 1975, but dropped below *U. americana* and *Q. macrocarpa* in 1997 (Figure 2). Ten other species had minor contributions to IV in 1975 and 1997; among these species, *Carpinus caroliniana, Quercus coccinea, Q. alba,* and *Carya cordiformis* were not resampled in 1997.

Shifts in species importance corresponded to changes in size class distribution (Figure 7). Among all species, the greatest changes were an increase from 113 to 137 stems/ha in the 1 - < 2 dm size class and a drop from 69 to 32 stems/ha between 4 - < 6 dm. *Acer saccharum* made a large contribution to these changes by increasing to over 100 stems/ha in the smallest (1 - < 2 dm) size class and by dropping from 32 to 12 stems/ha in the 4 - < dm range. Based on age-dbh regression, the 4 - < 5 dm size class corresponds to a maple cohort that began in about 1875 (age = dbh * 2.234 + 0.55). The oldest maples, found in the 8—9 dm size class in 1997, may have originated in about 1807, or earlier if they had survived as suppressed saplings. *Quercus rubra,* the most abundant oak in the mesic stand, also had a peak size class distribution in the 4 - < 5 dm range, which corresponds to an origin of about 1870 (age = dbh * 1.74 + 26.7). The largest *Q. rubra* individuals, found in the 8—9 dm size class in 1997, probably originated in about 1822, while *Q. alba* and *Q. macrocarpa* individuals, which are infrequent, predate 1800 in origin. *Fraxinus americana* stems peaked in the 5 - < 6 dm size class and also declined, but not enough cores were available to age this cohort. In the subcanopy, *Ulmus rubra* declined in the 1 - < 2 dm size class, but increased in the 3 - < 4 dm size class. *Ulmus americana* was present only in the 1 - < 4 dm size class range in 1975, and dropped almost 50% in stems/ha by 1997.

Significant changes occurred in sapling and shrub layer plots between 1975 and 1997. Sapling stems increased from 17 to 313 stems/ha in the 0.25 – 5 < 6.2 cm size class and from 148 to > 500 stems/ha in the 0.62 - 1 dm size class (Table 2). *Acer saccharum* accounted for 90% or more of the stems in these two classes, whereas *Carpinus caroliniana,* black cherry (*Prunus serotina*), and *Ulmus rubra* disappeared from the plots in 1997. In shrub-layer plots, total density dropped from 7000 stems/ha in 1976 to 1527 stems/ha in 1997 (Figure 4), and mean stem density and plot species richness dropped significantly from 7.0 to 1.53 stems/plot and from 1.53 to 0.85 species/plot (Figure 5). Only three shrub layer species were sampled, with *A. saccharum* accounting for 97% of all stems in 1997. *Ulmus rubra,* the only other important shrub layer species, had 1400 stems/ha in 1976, but was not resampled in 1997.

In 1997, the mesic ground layer sample included 29 native species. *Acer saccharum* was the most important species, followed by *Allium tricoccum* var. *burdickii, Erythronium albidum,* and *Podophyllum peltatum. Alliaria petiolata* was the only alien species sampled. Plot richness of native species averaged 4.95 species, with a Native Richness Index of 16.67 (Figure 6). Herbaceous species dominated the ground layer, but woody species accounted for > 40% importance (Figure 6).

DISCUSSION

Processes of forest change

The deterioration in forest composition and structure at the Ryerson Conservation Area fits a stand maturation model for mixed maple-oak stands that includes lack of oak reproduction, loss of mid-size-class oaks, and replacement of oaks by shade-tolerant species (e.g., Christensen 1977, Abrams and Downs 1990, Oliver and Larson 1990, Abrams 1992). These changes occur because oaks are relatively shade-intolerant and establish after canopy-opening disturbances. Survivorship of oak seedlings and saplings then declines as canopies close (Lorimer 1983, Lorimer 1985, Crow 1988, Crow 1992). As a result, oak stands are unstable or transitional without recurring disturbance, and shift toward an internal canopy gap-phase process that favors shade-tolerant species and leads to mortality of mid-size-class oaks (Lorimer 1981, McCune and Cottam 1985, Abrams 1992). The decline in shrub layer species also appears to fit the same model. Many shrubs sprout after fire and are relatively shade-intolerant, preferring the open conditions of white oak stands, and decline with increasing BA (McIntosh 1957, Loucks and Schnur 1976). However, as discussed below, different factors may have caused stand deterioration in the flatwoods and mesic stands.

Chronology and causes of change

The changes in composition and structure of forest stands at Ryerson Conservation Area appear to reflect responses to changes in disturbance regimes that began in the 1800s. Chicago region oak forest stands are assumed to have been subject to frequent fires prior to settlement, with oak cohorts becoming established during periods without fire (Gleason 1913, McAndrews 1966, Moran 1978, Grimm 1983, 1984, Anderson 1991, Bowles et al. 1994). Burning declined after settlement in the mid 1800s, but was often replaced by human disturbance, including tree cutting and grazing, as well as occasional burning (e.g., Nowacki and Abrams 1997, Mendelson 1998). The peak size class distributions for oaks at Ryerson corresponds to the late 1800s, which suggests that burning or other disturbances were halted at that time, allowing establishment of oak cohorts in the flatwoods and mesic forest stands. Logging after the 1871 Chicago fire may have opened tree canopies and allowed establishment of oaks and maples.

The high degree of natural fire protection afforded to the mesic stand by its landscape position suggests that factors other than human-caused fire protection have contributed to its historic changes and current composition

and structure. Nevertheless, these changes are at least indirectly linked to human causes such as the introduction of Dutch elm disease, over-grazing, and control of predators that has allowed deer herds to expand. For example, the loss of canopy *Ulmus americana* in the 1960s could have released the large cohort of sapling sugar maples, as well as the smaller red elm and black cherry. In Wisconsin, elm death promoted shrub growth in floodplain forests (Dunn 1986, 1987). However, previous grazing, as well as maple dominance, may have reduced the shrub layer and prevented a release after elm mortality. Recent changes in shrub layer structure and composition could also be related to over-browsing by deer, which winter-browse many shrubs and tree saplings and tend to prefer oaks and avoid maple (Strole and Anderson 1992). Stems and sprouts of blue beech are also heavily browsed by deer, which could have contributed to its decline in the understories of both stands, and its high importance in the flatwoods ground layer due to sprouting. The presence of old-growth oaks in the mesic stand may be evidence that some historic disturbances operated at scales larger than small canopy gaps, which favor maples (Canham 1985). Periodic fire could have been one of these factors. Another possibility is that the position of this stand on a floodplain terrace allows periodic flooding and ice-scouring that help maintain disturbance-adapted species such as oaks.

Projected changes and impacts

In northern flatwoods, the increase in BA and its gain in larger size classes indicate a trend toward old-growth structure. Because of the loss of mid-size class oaks and lack of oak reproduction, increasing ash and elm saplings appear poised to eventually enter the tree canopy. However, Dutch elm disease would prevent most elms from reaching canopy status, leaving ash species as future canopy replacements of oaks. The drop in shrub layer stem densities and species richness also indicates that the flatwoods shrub layer will become more monotypic with fewer shrubs and more tree saplings. Decline of hazel is particularly undesirable, as this shrub species dominated presettlement woody undergrowth and provides an important wildlife food source (Bowles et al. 1994, Bowles and Spravka 1994).

The structure and composition of the mesic stand are at a more advanced stage of maturation and development than the flatwoods because its landscape position on the fire-protected east side of the Des Plaines River allowed development of late-successional forest conditions (Moran 1978). However, recent changes mirror those that occurred in flatwoods, including a 20-year decline in mid-size class trees, an increase in shade-tolerant saplings (maples), and loss of shrub layer stem density and species richness. The drop in BA associated with its shift toward larger size classes may be due to replacement of larger oaks by smaller maples of similar ages. The increase in maple saplings indicates that this species should continue to replace oak, ash, and red elm and eventually replace old growth oaks as they are lost from the canopy. As in flatwoods, the shrub layer appears to be shifting toward dominance by few species; in this case, maples that will continue to add new cohorts to this stand.

Changing woody vegetation composition and structure may negatively affect animals and other plants. For example, shrub layers provide nesting habitat for forest interior songbirds (Whelan and Dilger 1992). Although we do not know if the decline in shrub layer stem densities at Ryerson has fallen below nesting thresholds for different bird species, a trend of continued decline should be of concern. Most plant species richness in forest stands occurs in the ground layer, in which richness decreases along a decreasing light gradient (Bowles and McBride 1998, Bowles et al. 2000). Although we lack data from 1976, a trend of decreasing ground-layer richness could have paralleled the decline in shrub-layer species, and might be more advanced in the mesic stand. For example, the 33.4 Native Richness Index value for the flatwoods exceeded index values for most Chicago region forest stands, which averaged 14.16 for maple stands, 22.58 for red oak stands, and 23.35 for white oak stands (Bowles et al. 2000). But the 16.7 NRI for the mesic stand was below that of most stands. The potential also exists for loss of a multitude of invertebrate species that would use declining understory species as obligate hosts.

MANAGEMENT ISSUES AND RECOMMENDATIONS

If maintaining biodiversity is a management objective of ecological restoration, it will be important to set appropriate restoration goals and alternatives. Although vegetation change is natural and expected (Pickett et al. 1992), restoration requires a context or reference system (Aronson et al. 1995), as well as implementation of processes needed to maintain the restored system. With respect to Ryerson, alternatives might include 1) returning composition and structure to a presettlement condition, 2) restoring historic (1975—1976) conditions, or 3) maintaining the composition and structure found in 1996 and preventing further species declines; each alternative will require restoration of fire to some degree as a system process. These potential targets involve tradeoffs and uncertainties. Presettlement conditions might be most desirable if we assume that they will maximize biodiversity, but we lack historic measures to set highly specific targets, and presettlement fire regimes are poorly known. The 1975—1976 data provide a more precise target for composition and structure; but they also represent a time frame under human influence, and it is unknown whether these conditions can be achieved or maintained. Maintaining current conditions may be most efficient, but involves a measurable loss of species richness that could be unacceptable to conservationists.

Once management goals are set, research will be needed to determine how woody species composition and structure can be managed and the effects of such management on other components of biodiversity. Because of the large amount of historic evidence for fire as a critical process in development and maintenance of oak forests (Crow 1988, Lorimer 1992, Abrams 1992), effects of fire must be a major component of a research strategy. As illustrated at Ryerson, landscape positions of forest stands determined the degree to which they were structured by fire and offer guidelines for the types of restoration management research they may require. The location of the Ryerson flatwoods in the woodland transition between forest and savanna, and its dominance by oaks, suggests tht fire was important in maintaining this stand, and that fire protection may have led to its recent structural changes. Therefore, fire will be critical for its management if restoration of early historic conditions are a goal.

The mesic forest location in a floodplain terrace and its dominance by old-growth maple indicate that fire would be a less important restoration tool for this stand, as it apparently owes its existence more to landscape fire protection than to fire (Moran 1978). Although the recent increase in maple saplings appears to have resulted from Dutch elm disease, a 1997 prescribed ground fire significantly reduced stem densities of seedling-size maples in this stand (Bowles et al. 2000). Thus, prescribed burning could be effective in reducing maples. Because of the presence of Dutch elm disease, it appears impossible to restore previous stand structure that included canopy elms. This suggests that novel management goals and multiple management tools may be needed for this stand.

Re-introducing fire may not reverse the canopy-level changes that appear to have caused losses of understory trees and shrubs. Therefore, we need to better understand how to manage canopy structure. This will entail numerous research questions. For example, at what scale do canopy gap dynamics in forest fragments maintain sufficient light levels for oak and shrub regeneration and for enhancing ground layer vegetation? Crow (1992) found that reduction of overstory and understory vegetation density increased survivorship and growth of *Q. rubra* seedlings relative to full canopy cover. Pubanz and Lorimer (1992) and Lorimer et al. (1994) found that reduction of canopy cover to 85% and removal of competing understory saplings enhanced oak seedling survivorship and growth, but suggested fire as a more natural alternative. Bowles and McBride (1998) found that canopy light controlled the distribution of graminoid and herbaceous ground layer vegetation in savanna, and recommended subcanopy thinning to restore ground layer structure. Also, what is the direct effect of differing fire frequencies and intensities on ground layer vegetation, and how does fire interact with reduced canopy cover to affect this vegetation? Luken and Shea (2000) found that burning an upland maple forest did not affect groundlayer richness, but did reduce maple stem densities of maple saplings. The ground fire that reduced maple densities at Ryerson still resulted in surviving maples at 1000—4000 stems/ha, which could allow significant maple recruitment (Bowles et al. 2000).

There are also important differences between presettlement fires and prescribed burns that have implications for management. Modern management fires do not occur in a landscape-scale presettlement context. As a result, they may not attain the intensity of large-scale fires, and may have different effects. Present-day fires can open seed beds that enhance establishment and spread of *Alliaria petiolata* (Anderson et al. 1996). Management fires may have severe negative effects on fire-sensitive organisms, and impacts of a variable fire regime on animals associated with forest vegetation are poorly known. This is particularly a concern in fragmented landscapes where many species have no fire refuge or source of recolonization after fire. Alternatives to fire may require artificial reduction of canopy cover by removal of sub-canopy trees and selective removal of larger maple saplings that would quickly fill canopy gaps created by management. Control of deer herds is apparently critical, as continued over-grazing may prevent recovery of woody and herbaceous species such as *Trillium grandiflorum* (Anderson 1994). These are difficult management decisions that should be tested by sound experimental approaches and more frequent monitoring than at 20-year intervals.

ACKNOWLEDGMENTS

We thank the Nancy Ryerson Ranney Leadership Grants Program and Friends of Ryerson Woods, and The Chicago Wilderness and The Illinois Conservation Foundation for funding this project, and the Illinois Nature Preserves Commission and Lake County Forest Preserve for permission to conduct the study. We also thank Joan Palinscar and Becky Jernigan for field assistance.

REFERENCES

Abrams, M. D. 1992. Fire and the development of oak forests. BioScience 42:346—353.

Abrams, M. D. and J. A. Downs. 1990. Successional replacement of old-growth white oak by mixed mesophytic hardwoods in southwest Pennsylvania. Canadian Journal of Forest Research. 20:1864—1870.

Anderson, R. C. 1991. Presettlement forests of Illinois Pages 9—19 *in* G. V. Burger, J. E. Ebinger, and G. S. Wilhelm, editors, Proceedings of the Oak Woods Management Workshop, Eastern Illinois University, Charleston.

Anderson, R. C. 1994. Height of white-flowered trillium *(Trillium grandiflorum)* as an index of deer browsing intensity. Ecological Applications 4:104—109.

Anderson, R. C., S. S. Dhillon, and T. M. Kelley. 1996. Aspects of the ecology of an invasive plant, garlic mustard *(Alliaria petiolata)*, in central Illinois. Restoration Ecology 4:181—191.

Aronson, J., S. Dhillion, and E. Le Floc'h. 1995. On the need to select an ecology system of reference, however imperfect: a reply to Pickett and Parker. Restoration Ecology 3:1—3.

Bowles, M. and M. Spravka. 1994. American hazelnut, an overlooked native shrub in northeastern Illinois. The Morton Arboretum Quarterly 30:42—48.

Bowles, M. L. and J. L. McBride. 1998. Vegetation composition, structure and chronological change in a decadent Midwestern North American savanna remnant. Natural Areas Journal 18:14—27.

Bowles, M. L., M. D. Hutchison, and J. L. McBride. 1994. Landscape pattern and structure of oak savanna, woodland, and barrens in northeastern Illinois at the time of European settlement. Pages 65—73 *in* J. S. Fralish, R. C. Anderson, J. E. Ebinger, and R. Szafoni, editors, Proceedings of the North American Conference on Savannas and Barrens. Environmental Protection Agency, Great Lakes National Program Office, Chicago.

Bowles, M., M. Jones, J. McBride, T. Bell, and C. Dunn. 2000. Structural composition and species richness indices for upland forests of the Chicago region. Erigenia 18:30—57.

Canham, C. D. 1985. Suppression and release during canopy recruitment in *Acer saccharum.* Bulletin of the Torrey Botanical Club 112:134—145.

Christensen, N. L. 1977. Changes in structure, pattern and diversity associated with climax forest maturation in Piedmont, North Carolina. American Midland Naturalist 97:176—188.

Crow, T. R. 1988. Reproductive mode and mechanisms for self-replacement of northern red oak *(Quercus rubra)*: a review. Forest Science 34:19—40.

Crow, T. R. 1992. Population dynamics and growth patterns for a cohort of northern red oak *(Quercus rubra)* seedlings. Oecologia 91:192—200.

Curtis, J. T. 1959. Vegetation of Wisconsin. University of Wisconsin Press, Madison.

DeCalesta, D. 1994. Effects of white-tailed deer on songbirds within managed forests in Pennsylvania. Journal of Wildlife Management 58:711—718.

Dunn, C. P. 1986. Shrub layer response to death of *Ulmus americana* in southeastern Wisconsin lowland forests. Bulletin of the Torrey Botanical Club 113:142—148.

Dunn, C. P. 1987. Post-settlement changes in tree composition of southeastern Wisconsin forested wetlands. The Michigan Botanist. 26:43—51.

Gleason, H. A. 1913. The relation of forest distribution and prairie fires in the Middle West. Torreya 13:173—181.

Grimm, E. C. 1983. Chronology and dynamics of vegetation change in the prairie-woodland region of southern Minnesota, U.S.A. New Phytologist 93:311—350.

Grimm, E. C. 1984. Fire and other factors controlling the Big Woods vegetation of Minnesota in the mid-nineteenth century. Ecological Monographs 54:291—311.

Hett, J. M. 1971. A dynamic analysis of age in sugar maple seedlings. Ecology 52:1071—1074.

Lorimer, C. G. 1981. Survival and growth of understory trees in oak forests of the Hudson Highlands, New York. Canadian Journal of Forest Research 11:689—695.

Lorimer, C. G. 1983. A test of the accuracy of shade-tolerance classifications based on physiognomic and reproductive traits. Canadian Journal of Botany 61:1595—1598.

Lorimer, C. G. 1984. Development of the red maple understory in northeastern oak forests. Forest Science 30:3—22.

Lorimer, C. G. 1985. The role of fire in the perpetuation of oak forests. Pages 8—25 *in* Challenges in Oak Management and Utilization. J. E. Johnson, editor. Cooperative Extension Service, University of Wisconsin, Madison.

Lorimer, C. G. 1992. Causes of the oak regneration problem. Pages 14—39 *in* Oak Regneration: Serious Problems, Practical Recommendations. D. Loftis, C. E. McGee, editors. USDA Forest Service, Southeastern Forest

Experiment Station General Technical Report SE-84, Asheville, North Carolina.

Lorimer, C. G., J. W. Chapman and W. D. Lambert. 1994. Tall understory vegetation as a factor in the poor development of oak seedlings beneath mature stands. Journal of Ecology 82:227—237.

Loucks, O. L., and B. J. Schnur III. 1976. A gradient in understory shrub composition in southern Wisconsin. Pages 99—117 *in* Proceedings of the First Central Hardwood Forest Conference, J. S. Fralish, G. T. Weaver and R. C. Schlesigner, eds. Southern Illinois University, Carbondale.

Luken, J. O., L. M. Kuddes, T. C. Tholemeier and D. M. Haller. 1997. Comparative responses of *Lonicera maackii* (Amur honeysuckle) and *Lindera benzoin* (spicebush) to increased light. American Midland Naturalist 138:331—343.

Luken, J. O., and M. Shea. 2000. Repeated burning at Dinsmore Woods State Nature Preserve (Kentucky, USA): responses of the understory. Natural Areas Journal 20:150—158.

Marks, P. L., and S. Gardescu. 1988. A case study of sugar maple *(Acer saccharum)* as a forest seedling bank species. Journal of the Torrey Botanical Society 125:287—296.

McAndrews, J. H. 1966. Postglacial history of prairie, savanna and forest in northwest Minnesota. Memoirs of the Torrey Botanical Club 22(2):1—72.

McCune, B., and G. Cottam. 1985. The successional status of a southern Wisconsin oak woods. Ecology 66:1270—1278.

McGee, C. E. 1986. Loss of *Quercus* spp. dominance in an undisturbed old-growth forest. The Journal of the Elisha Mitchell Scientific Society 102:10—15.

McIntosh, R. P. 1957. The York Woods: a case history of forest succession in southern Wisconsin. Ecology 38:29—37.

Mendelson, J. 1998. Restoration from the perspective of recent forest history. Transactions of the Wisconsin Academy of Sciences, Arts and Letters 86:137—148.

Menges, E. S., and O. L. Loucks. 1984. Modeling a disease-caused patch disturbance: oak wilt in the midwestern United States. Ecology 65:487—498.

Miceli, J. C., G. L. Rolfe, D. R. Pelz and J. M. Edgington. 1977. Brownfield Woods, Illinois: woody vegetation changes since 1960. American Midland Naturalist 98:469—476.

Moran, R. C. 1978. Presettlement vegetation of Lake County, Illinois. Pages 12—18 *in* Proceedings of the Fifth Midwest Prairie Conference, D. C. Glenn-Lewin and R. Q. Landers, editors, Iowa State University, Ames.

Nowacki, G. J., and M. D. Abrams. 1997. Radial-growth averaging criteria for reconstructing disturbance histories from presettlement-origin oaks. Ecological Monographs 67:225—249.

Oliver, C. D., and B. C. Larson. 1990. Forest stand dynamics. McGraw-Hill, New York.

Pallardy, S. G., T. A. Night and E. Garrett. 1991. Sugar maple invasion in oak forests of Missouri. Pages 21—30 *in* Proceedings of the Oak Woods Management Workshop. G. V. Burger, J. E. Ebinger and G. S. Wilhelm, editors, Eastern Illinois University, Charleston.

Pickett, S. T. A., V. T. Parker and P. Fiedler. 1992. The new paradigm in ecology: implications for conservation biology above the species level. Pages 65—88 *in* P. Fiedler and S. Jain, editors, Conservation Biology: The Theory and Practice of Nature Conservation, Preservation and Management. Chapman and Hall, New York.

Pubanz, D. M., and C. G. Lorimer. 1992. Oak regeneration experiments in southwestern Wisconsin: two-year results. University of Wisconsin-Madison College of Agricultural and Life Sciences R3552.

Roovers, L. M., and S. R. Shifley. 1997. Composition and dynamics of Spitler Woods, an old-growth remnant forest in Illinois (USA). Natural Areas Journal 17:219-232.

Schlesinger, R. C. 1976. Hard maples increasing in upland hardwood stands. Pages 177—185 *in* Proceedings of the First Central Hardwood Forest Conference. Southern Illinois University, Carbondale, Illinois.

Strole, T. A., and R. C. Anderson. 1992. White-tailed deer browsing: species preferences and implications for central Illinois forests. Natural Areas Journal 12:139—144.

Swink, F., and G. Wilhelm. 1994. Plants of the Chicago Region. The Morton Arboretum, Lisle, Illlinois.

Vogl, R. J., and A. M. Beck. 1970. Response of white-tailed deer to a Wisconsin wildfire. The American Midland Naturalist 84:270—273.

Whelan, C. J., and M. L. Dilger. 1992. Invasive, exotic shrubs: a paradox for natural area managers? Natural Areas Journal 12:109—110.

White, J., and M. H. Madany. 1978. Classification of natural communities in Illinois. Appendix 30 *in* J. White (author). Illinois Natural Areas Inventory Technical Report. Illinois Natural Areas Inventory, Urbana.

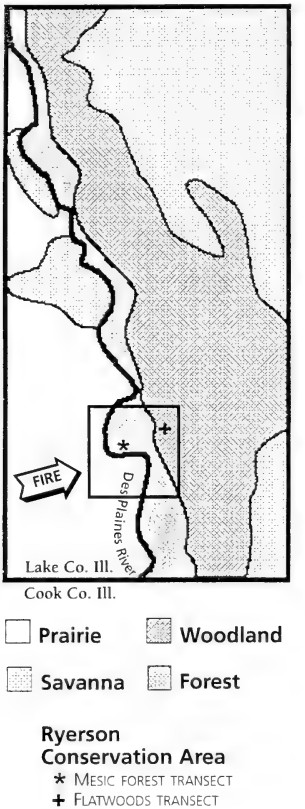
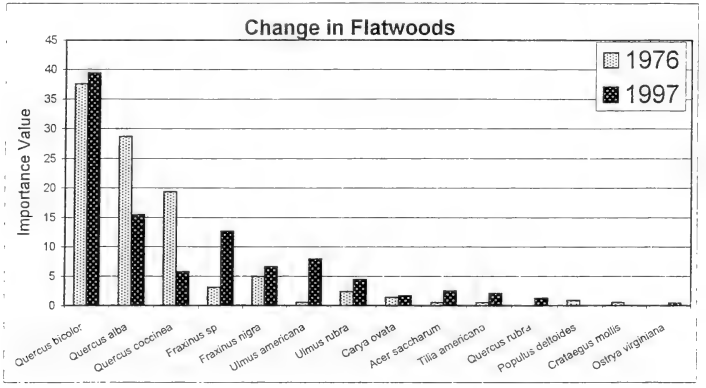


Figure 1) Landscape model for the pattern of presettlement savanna, woodland and forest in relation to the firebreak effect of the DesPlaines River in Lake County, Illinois (following Moran 1978). Arrow indicates direction of prairie fires driven by prevailing westerly winds. Inset is S26 (T43N, R11E) and shows, at Ryerson Conservation Area, the location of mesic forest (*) and flatwoods (+) transects within presettlement forest and woodland, respectively.



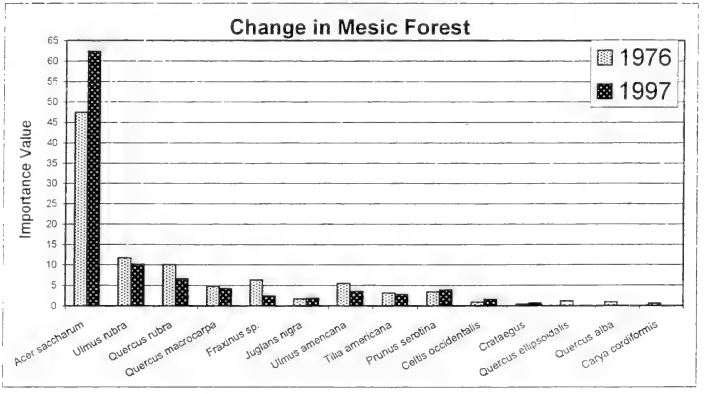


Figure 2) Importance values of tree species in 1975—1976 and in 1977 in flatwoods (upper) and in mesic forest (lower) at Ryerson Conservation Area.

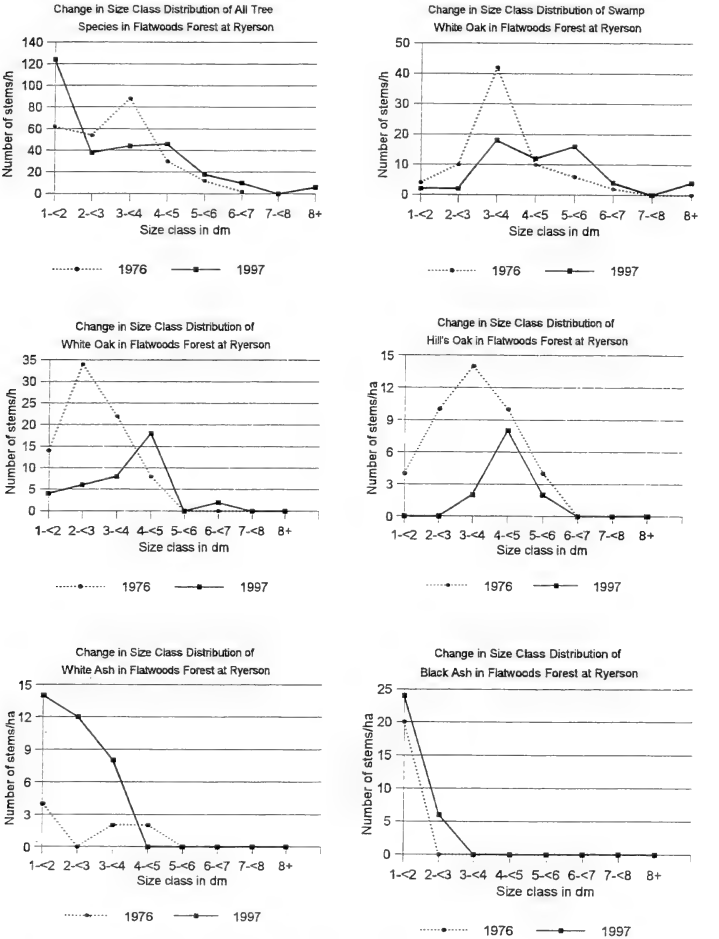
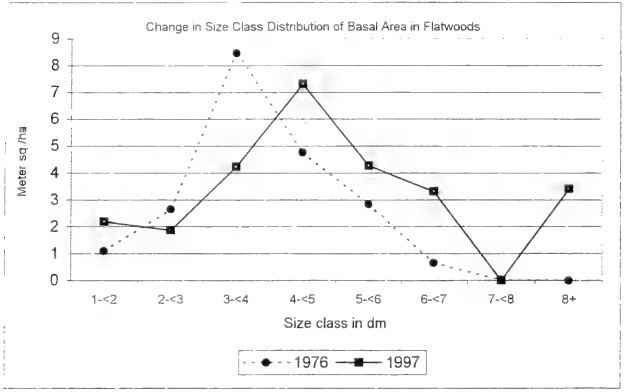


Figure 3) Temporal changes in size class distribution of all tree species and dominant tree species in flatwoods at Ryerson Conservation Area.



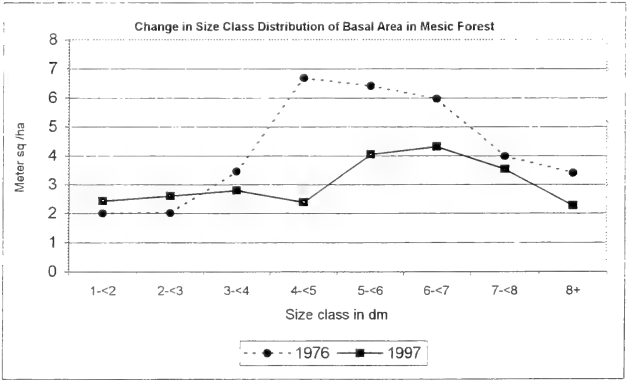
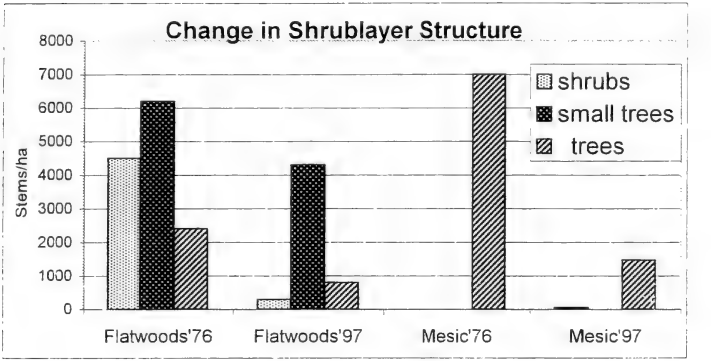


Figure 4) Temporal change and size class distribution of basal area in flatwoods (upper) and in mesic forest (lower) at Ryerson Conservation Area.



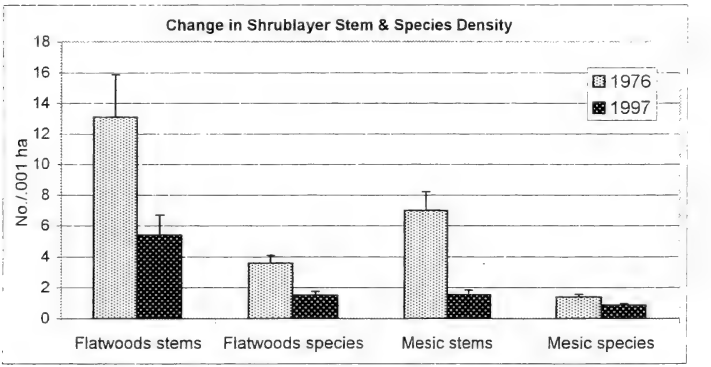


Figure 5) Temporal change in shrub layer structure (upper) and shrub layer stem density and species richness (lower) in flatwoods and mesic forest at Ryerson Conservation Area. Structure: flatwoods $P < 0.001$; mesic forest $P = 0.648$; density, all values $P < 0.01$.

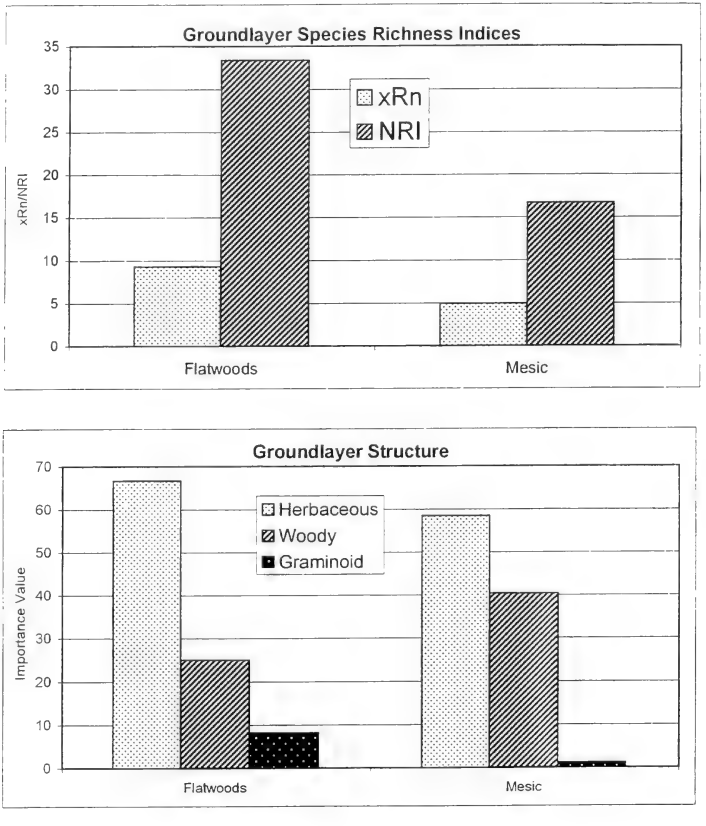


Figure 6) Groundlayer species richness (upper) and vegetation structure (lower) differed between flatwoods and mesic forest in 1997 at Ryerson Conservation Area. NRI = native richness index; xRn = mean plot richness of native species.

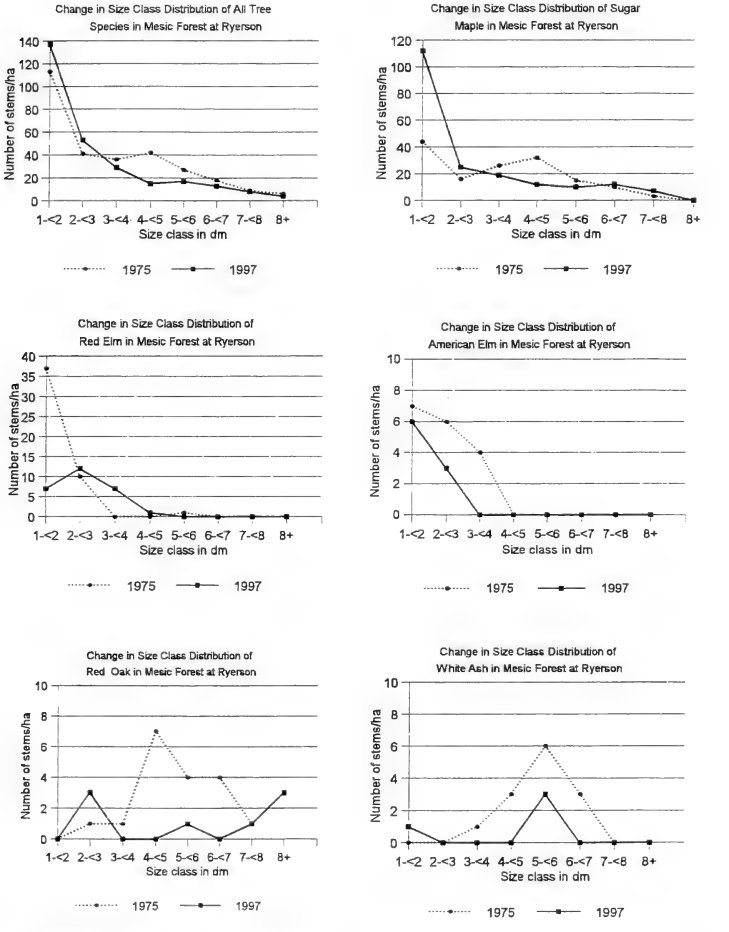


Figure 7) Twenty-year changes in size class distribution of all tree species and dominant tree species in mesic forest at Ryerson Conservation Area.

Table 1. Ryerson Conservation Area sampling methods used in 1975 by C. Bushey and R. Moran, and in 1976 by the Illinois Natural Areas Inventory field ecologists (K. Wilson and R. Moran).

Date	Vegetation type	Source
1975	Mesic upland forest	Bushey and Moran
1976	Mesic upland forest	Illinois Natural Areas Inventory
1976	Northern flatwoods	Illinois Natural Areas Inventory

Vegetation type	INAI (1976)	Bushey-Moran (1975)
Trees ≥ 1 dm dbh	20 plots (0.025 ha)	68 plots (0.01 ha)
	1 dm size class distribution	presence
	wedge prism point samples	density
		dbh
Shrubs and trees < 1 dm dbh	10 plots (0.001 ha)	68 plots (0.01 ha)
	presence	presence
	density	density / 3.7 cm size class

Table 2. Temporal change in tree sapling stems/ha by size class (2.5 - < 6.2 cm and 6.2 - < 10 cm), based on 68 circular 100m^2 (.01 ha) plots in mesic forest at Ryerson Conservation Area.

	0.25 - < 6.2 cm		**6.2 - < 10 cm**	
	1975	1977	1975	1997
Acer saccharum	14.71	307.35	107.35	475.0
Ulmus rubra	1.47	0	13.24	0
Carpinus caroliniana	0	0	8.82	0
Ulmus americana	1.47	2.94	5.88	18.0
Celtis occidentalis	0	0	4.41	1.47
Prunus serotina	0	0	2.94	0
Tilia americana	0	0	2.94	4.41
Crataegus spp	0	2.94	2.94	2.94
Carya cordiformis	0	0	0	1.47
Quercus macrocarpa	0	0	0	1.47
Ostrya virginiana	0	0	0	2.94
TOTAL	17.64	313.24	148.53	505.88

Appendix 1. Temporal change in tree species density, basal area, and Importance Values in flatwoods at Ryerson Conservation Area.

1976	BA	RBA	Density	R. Den.	IV
Quercus bicolor	8.95	43.66	78	31.45	37.56
Quercus alba	5.31	25.88	78	31.45	28.67
Quercus coccinea	4.45	21.70	42	16.94	19.32
Fraxinus americana	0.58	2.84	8	3.23	3.03
Fraxinus nigra	0.35	1.72	20	8.06	4.89
Ulmus americana	0.04	0.17	2	0.81	0.49
Ulmus rubra	0.30	1.46	8	3.23	2.34
Carya ovata	0.23	1.11	4	1.61	1.36
Acer saccharum	0.04	0.17	2	0.81	0.49
Tilia americana	0.04	0.17	2	0.81	0.49
Quercus rubra	0.00	0.00	0	0.00	0.00
Populus deltoides	0.19	0.94	2	0.81	0.87
Crataegus mollis	0.04	0.17	2	0.81	0.49
Ostrya virginiana	0.00	0.00	0	0.00	0.00
TOTAL	20.50	100.00	248	100.00	100.00

1997	BA	RBA	Density	R. Den.	IV
Quercus bicolor	14.46	54.36	70	24.48	39.42
Quercus alba	4.66	17.52	38	13.29	15.40
Quercus coccinea	1.94	7.29	12	4.20	5.74
Fraxinus americana	2.26	8.50	48	16.78	12.64
Fraxinus nigra	0.72	2.70	30	10.49	6.60
Ulmus americana	0.86	3.22	36	12.59	7.90
Ulmus rubra	0.85	3.19	16	5.59	4.39
Carya ovata	0.14	0.53	8	2.80	1.66
Acer saccharum	0.21	0.80	12	4.20	2.50
Tilia americana	0.18	0.66	10	3.50	2.08
Quercus rubra	0.29	1.09	4	1.40	1.25
Populus deltoides	0.00	0.00	0	0.00	0.00
Crataegus mollis	0.00	0.00	0	0.00	0.00
Ostrya virginiana	0.04	0.13	2	0.70	0.42
TOTAL	26.61	100.00	286	100.00	100.00

Appendix 2. Temporal change in tree species frequency, density, basal area and Importance Values in mesic forest at Ryerson Conservation Area.

1975	Freq.	Rel. Freq.	Dens/ha	Rel. Dens.	BA/ha	Rel. BA	IV
Acer saccharum	75.00	45.10	144.12	48.00	17.18	50.11	47.74
Ulmus rubra	25.00	15.00	48.53	16.20	1.29	3.78	11.66
Quercus rubra	14.70	8.80	23.53	7.80	4.68	13.64	10.08
Fraxinus sp.	10.30	6.20	13.24	4.40	2.81	8.19	6.26
Ulmus americana	13.20	7.90	17.65	5.90	0.91	2.66	5.49
Quercus macrocarpa	5.90	2.40	7.35	2.45	3.24	9.44	4.76
Tilia americana	7.35	4.40	11.76	3.90	0.43	1.24	3.18
Prunus serotina	4.40	2.65	14.71	4.90	0.88	2.57	3.37
Juglans nigra	2.90	1.70	4.41	1.50	0.69	2.02	1.74
Carpinus caroliniana	4.40	2.65	4.41	1.50	0.06	0.17	1.44
Populus deltoides	1.50	0.90	1.47	0.50	0.88	2.57	1.32
Quercus ellipsoidalis	1.50	0.90	1.47	0.50	0.71	2.06	1.15
Celtis occidentalis	2.90	1.70	2.94	1.00	0.03	0.09	0.93
Quercus alba	1.50	0.90	1.47	0.50	0.44	1.29	0.90
Carya cordiformis	1.50	0.90	1.47	0.50	0.04	0.13	0.51
Crataegus sp.	1.50	0.90	1.47	0.50	0.01	0.04	0.48
TOTAL	173.6	100.0	300.0	100.0	34.28	100.0	100.0

1997	Freq.	Rel. Freq.	Dens/ha	Rel. Dens.	BA/ha	Rel. BA	IV
Acer saccharum	91.18	54.39	198.53	69.95	16.04	62.70	62.34
Prunus serotina	10.29	6.14	10.29	3.63	0.44	1.72	3.83
Ulmus rubra	14.03	19.00	27.94	9.84	1.69	6.61	10.16
Ulmus americana	8.82	5.26	8.82	3.11	0.56	2.18	3.52
Crataegus sp.	1.47	0.88	2.94	1.04	0.03	0.11	0.68
Tilia americana	5.88	3.51	7.35	2.59	0.56	2.18	2.76
Quercus rubra	8.82	5.26	8.82	3.11	2.91	11.38	6.58
Fraxinus sp.	4.41	2.63	4.41	1.55	0.76	2.99	2.39
Celtis occidentalis	4.41	2.63	4.41	1.55	0.18	0.69	1.63
Quercus macrocarpa	5.88	3.51	7.35	2.59	1.66	6.49	4.20
Juglans nigra	2.94	1.75	2.94	1.04	0.75	2.93	1.91
TOTAL	158.13	100.0	208.82	100.0	25.38	100.0	100.0

Appendix 3. Temporal change in density per hectare of shrub layer species sampled in .001 ha plots in northern flatwoods and mesic forest in Ryerson Conservation Area.

	Northern flatwoods		Mesic forest	
	1976	1997	1976	1997
SHRUBS				
Cornus racemosa	400	50	---	---
Corylus americana	3,700	100	---	---
Menispermum canadense	300	0	---	---
Ribes missourienses	---	---	0	53
Viburnum prunifolium	0	150	---	---
Viburnum rafinesquianum	100	0	---	---
SMALL TREES				
Carpinus caroliniana	4,100	2,850	---	---
Crataegus pruinosa	1,200	0	---	---
Crataegus punctata	200	0	---	---
Crataegus sp.	0	150	---	---
Ilex verticillata	0	1,150	---	---
Ostrya virginiana	700	150	---	---
TREES				
Acer saccharum	100	250	5,600	1,474
Carya cordiformis	0	150	---	---
Carya ovata	100	0	---	---
Fraxinus americana	1,100	0	---	---
Fraxinus nigra	200	150	---	---
Fraxinus pennsylvanica	0	100	---	---
Prunus serotina	100	0	---	---
Quercus ellipsoidalis	100	0	---	---
Ulmus americana	0	100	---	---
Ulmus rubra	700	50	1,400	0
SUMMARY				
Shrub layer stems/ha	13,100	5,400	7,000	1,527
Shrubs	4,500	300	0	53
Small trees	6,200	4,300	0	0
Trees	2,400	800	7,000	1,474

Appendix 4. Frequency, cover, and importance values of northern flatwoods groundlayer vegetation at Ryerson Conservation Area.

	freq	mean cover	IV
HERBACEOUS			
Potentilla simplex	50.00	3.50	6.95
Geum canadensis	65.00	2.34	6.35
Galium aparine	15.00	4.35	6.11
Geranium maculatum	40.00	2.25	4.89
Impatiens sp.	35.00	2.45	4.86
Floerkea proserpinacoides	35.00	2.15	4.50
Polygonum punctatum	50.00	1.45	4.45
Claytonia virginica	45.00	0.75	3.33
Anemone quinquefolia	20.00	1.80	3.26
Galium sp.	20.00	0.90	2.17
Cardamine bulbosa	30.00	0.35	2.03
Arisaema triphyllum	20.00	0.65	1.87
Aster lateriflorus	25.00	0.35	1.77
Viola cucullata	15.00	0.60	1.54
Polygonum virginianum	20.00	0.20	1.32
Allium canadense	5.00	0.75	1.18
Prunella vulgaris	15.00	0.15	0.99
Ranunculus septentrionalis	10.00	0.20	0.78
Aster schreberi	5.00	0.40	0.76
Aster macrophyllus	5.00	0.40	0.76
Fragaria virginiana	10.00	0.15	0.72
Circaea lutetiana	10.00	0.10	0.66
Arisaema dracontium	10.00	0.10	0.66
Trillium recurvatum	10.00	0.10	0.65
Arenaria lateriflora	5.00	0.10	0.39
Viola conspersa	5.00	0.10	0.39
Prenanthes sp.	5.00	0.10	0.39
Smilacina stellata	5.00	0.05	0.33
Smilax lasioneura	5.00	0.05	0.33
Asarum canadensis	5.00	0.05	0.33
Viola sp.	5.00	0.05	0.33
Unknown herb	5.00	0.05	0.33
Erythronium albidum	5.00	0.05	0.33
Epilobium coloratum	5.00	0.05	0.33
Oxalis stricta	5.00	0.05	0.33
Smilacina racemosa	5.00	0.05	0.33
Total			66.69

	freq	mean cover	IV
WOODY			
Carpinus caroliniana	30.00	3.45	5.82
Ilex verticillata	5.00	2.00	2.71
Rhus radicans	35.00	0.60	2.61
Lonicera prolifera	25.00	0.80	2.32
Rubus pubescens	15.00	1.05	2.09
Acer saccharum	15.00	0.65	1.60
Viburnum prunifolium	5.00	0.75	1.18
Crataegus sp.	15.00	0.20	1.05
Fraxinus sp.	15.00	0.14	0.98
Prunus virginiana	10.00	0.35	0.96
Parthenocissus sp.	5.00	0.50	0.88
Rubus occidentalis	5.00	0.25	0.57
Fraxinus americana	5.00	0.25	0.57
Quercus alba	5.00	0.10	0.39
Fraxinus nigra	5.00	0.05	0.33
Prunus serotina	5.00	0.05	0.33
Quercus bicolor	5.00	0.05	0.33
Quercus ellipsoidalis	5.00	0.05	0.33
total			25.04
GRAMINOID			
Cinna arundinacea	40.00	0.85	3.18
Carex gracillima	10.00	1.30	2.12
Carex blanda	15.00	0.15	0.99
Carex sp.	10.00	0.10	0.66
Glyceria striata	10.00	0.10	0.66
Carex sp. #2	5.00	0.05	0.33
Carex tribuloides	5.00	0.05	0.33
total			8.27

Plot species richness	9.30
Species richness index	72.64
Native plot species richness	9.30
Native richness index	72.64
Alien component	0

Appendix 5. Frequency, cover, and importance values of mesic forest groundlayer vegetation at Ryerson Conservation Area.

	freq	mean cover	IV
WOODY			
Acer saccharum	89.47	12.51	26.00
Fraxinus sp.	36.84	0.39	4.22
Prunus serotina	26.32	0.25	2.97
Ribes missourienses	15.79	0.79	2.66
Ulmus sp.	15.79	0.14	1.77
Prunus virginiana	5.26	0.74	1.53
Vitis riparia	5.26	0.05	0.60
Parthenocissus inserta	5.26	0.05	0.59
total			40.34
HERBACEOUS			
Allium burdickii	52.63	10.37	19.40
Erythronium albidum	57.89	3.36	10.37
Podophyllum peltatum	26.32	3.84	7.87
Circaea lutetiana	21.05	0.32	2.54
Geranium maculatum	15.79	0.42	2.15
Isopyrum biternatum	15.79	0.37	2.08
Arisaema triphyllum	15.79	0.26	1.94
Trillium grandiflorum	15.79	0.15	1.79
Cirsium sp.	10.53	0.09	1.18
Impatiens sp.	5.26	0.37	1.03
Polygonum virginianum	5.26	0.21	0.81
Anemone quinquefolia	5.26	0.16	0.74
Allium canadense	5.26	0.11	0.67
Smilacina racemosa	5.26	0.05	0.60
Dicentra cucullaria	5.26	0.05	0.60
Geum canadensis	5.26	0.05	0.60
Unknown seedling	5.26	0.05	0.59
Geum sp.	5.26	0.05	0.59
Trillium recurvatum	5.26	0.05	0.59
total			56.14
ALIENS			
Alliaria petiolata	5.26	1.32	2.32
GRAMINOID			
Carex sp.	5.26	0.05	0.60
Leersia virginica	5.26	0.05	0.60
total			1.20

Plot species richness	5.00
Species richness index	27.39
Native plot species richness	4.95
Native richness index	27.10
Alien component	0.29

ERIGENIA Number 19, September 2003, pp. 52—59

VEGETATION OF ALLISON PRAIRIE – A GRAVEL PRAIRIE RECONSTRUCTION IN LAWRENCE COUNTY, ILLINOIS

Bob Edgin[1], Brian Garrard, Gordon C. Tucker, and John E. Ebinger[2]

ABSTRACT: The vascular flora of a 2 ha gravel prairie reconstruction in Lawrence County, Illinois, was studied during the growing season of 2001. Frequency (%), average cover (%), and importance value (IV = 200) of the taxa were determined using randomly located quadrats along a line transect. A total of 181 taxa were observed on the site: 1 fern, 1 gymnosperm, 49 monocots and 130 dicots, of which 16 were woody taxa and 49 introduced exotics. A total of 31 taxa were encountered in the sample plots. *Heterotheca camporum* (Greene) Shinners (golden aster) had the highest importance value (39.1), followed by *Sporobolus asper* (Michx.) Kunth. (northern dropseed), *Andropogon gerardii* Vitman (big bluestem), *Melilotus* sp. (sweet clover), *Opuntia humifusa* (Raf.) Raf. (prickly pear), and *Schizachyrium scoparium* (Michx.) Nash (little bluestem). The state endangered *Silene regia* Sims (royal catchfly) also occurs on the site.

INTRODUCTION

At the time of European settlement about 61% of Illinois was covered with prairie (Iverson et al. 1991). The most common were "black soil" prairies that covered extensive areas throughout the central part of the state, creating what was commonly referred to as the prairie peninsula (Transeau 1935, Schwegman 1973). Many other prairie community types were common in Illinois, including the prairies associated with the extensive loess and glacial-till deposits along major rivers (Evers 1955), and the prairies associated with extensive sand deposits on glacial out-wash from the Wisconsin glaciation. Other, less common prairie types occur in Illinois, including gravel, dolomite, and shrub prairies (White and Mandany 1978).

Gravel prairies are rarely encountered, being associated with valley train deposits along a few rivers and streams in central and northern Illinois. These gravel prairies are rare in the midwest, many having been destroyed by mining operations. Occurring on kames and eskers mostly in the Northeastern Morainal Division of Illinois, and on the slopes of gravel terraces along major rivers, few of the prairies have been studied. Fell and Fell (1956) listed the plant species and associations of a few gravel hill prairies along the Rock River in Winnebago County, while Post et al. (1985) examined three gravel hill prairies along Wea Creek, a tributary of the Wabash River in north-central Indiana. A few gravel prairies are dedicated Illinois nature preserves, but have not been studied in detail (McFall and Karnes 1995).

Historical records indicate that gravel prairies occurred in east-central Illinois, particularly along the Wabash River and its tributaries in theWabash Border Natural Division (Schwegman 1973). The northern part of this division was subjected to Wisconsin glaciation, while glacial melt water resulted in the formation of a broad floodplain and terrace deposits of sand and gravel in the southern part of the division. In some locations, gravelly clay loam and sandy loam soils developed on sand and gravel deposits that were at or near the surface (Fehrenbacher et al. 1967). Prairies developed on these soils of low water holding capacity. Government Land Office surveyors reported the existence of an extensive prairie, approximately 64 km^2, on the floodplain of the Wabash River in the northern part of Lawrence County, Illinois (Hutchison 1988, Edgin 1996). Most of this prairie was described as wet; however, the southeast portion of T4N R11W contained a nearly level, dry prairie with a thin gravelly soil. Following European settlement, these prairies were converted to agriculture production. Presently, small prairie remnants remain, mostly in cemeteries, along roadsides, and in railroad rights-of-way.

Because of these historical records, John E. Schwegman (retired, Illinois Department of Natural Resources) initiated a reconstruction of a gravel prairie in eastern Lawrence County in 1991. The purpose of this study is to determine

[1] Illinois Nature Preserves Commission, IDNR, One Natural Resources Way, Springfield, Illinois 62702-1271

[2] Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois, 61920

the floristic composition and structure of this gravel prairie reconstruction. These data will enable the evaluation of the vegetational trends, and determine probable management goals for the future. The status of the state endangered *Silene regia* Sims (royal catchfly) on the prairie will also be discussed.

DESCRIPTION OF THE STUDY AREA

The 2 ha Allison Prairie reconstruction is located 10 km northeast of Lawrenceville, Lawrence County, Illinois (NE ¼, NW ¼, S 25, T4N, R11W). The project to reconstruct a gravel prairie typical of the Wabash Border Natural Division was initiated in May 1991 with the execution of a management agreement between the Illinois Department of Natural Resources (IDNR) and the Bi-State Airport Authority which owns the property. Prior to this agreement, a floristic survey of ten sand and gravel prairie remnants located near the study area was conducted in 1988, and 91 sand and gravel prairie taxa were found (Schwegman 1988, unpublished). Using this information, seeds and plants for the reconstruction were collected from remnant communities and sown or translocated to the north half of the study area in October 1991 and October 1993. Seeds from *Andropogon gerardii* Vitman (big bluestem), *Bouteloua curtipendula* (Michx.) Torr. (side-oats grama), *Schizachyrium scoparium* (Michx.) Nash (little bluestem), *Sorghastrum nutans* (L.) Nash (Indian grass), and *Sporobolus asper* (Michx.) Kunth. (northern dropseed) were planted in the north half of the study area using a no-till drill. Approximately 3,300 rootstocks obtained from the IDNR nursery were transplanted in the south half of the study area in May 1998.

Management practices include several brush removal efforts which were undertaken from 1993 to 2001 to eliminate *Ulmus pumila* L. (Siberian elm), *Celtis occidentalis* L. (hackberry), and *Lonicera maackii* (Rupr.) Maxim. (Amur honeysuckle) from the south half of the study area. Prescribed burning of the entire area was conducted in the spring of 1998, 2000, and 2001. Some gravel deposits had been removed from the north half of the study area several years prior to the initiation of the reconstruction effort.

The soils of the study area are Carmi loam (Fehrenbacher and Odell 1956). These terrace soils developed under grass on slopes of 0 to 4 %. The surface soil is a friable, 25 to 30 cm thick loam containing considerable coarse sand. The subsoil is about 60 cm thick and composed of yellowish brown clay loam to gravelly clay loam. Permeability to water is moderately rapid and gravel is found at a depth of 85 to 90 cm, making the soil somewhat droughty.

The climate is continental, characterized by humid, hot summers and cold winters. Weather station records for Vincennes, Indiana, about 10 km from the preserve, gives the annual precipitation as 111.5 cm, most of which falls as rain during the period of April to September. Average rainfall is highest during the month of May (11.2 cm) and lowest during February (6.6 cm). The average temperature for January is -0.7° C with an average maximum of 3.6° C and an average minimum of -5.5° C. The average temperature for July is 25.5° C with an average maximum of 31.1° C and an average minimum of 19.0° C. The frost-free growing period averages 180 days per year (Fehrenbacher and Odell 1956).

MATERIALS AND METHODS

Observations to determine the vascular flora of the site were conducted from April through September 2001. Voucher specimens were collected for each taxon and deposited in the herbarium of the Illinois Natural History Survey, Champaign, Illinois. Monitoring of the royal catchfly was conducted in late July or early August of 1998, 1999, and 2001. Nomenclature follows Mohlenbrock (1986). Designation of introduced taxa follows Mohlenbrock (1986) and Gleason and Cronquist (1991).

On September 25, one 50 meter long transect was randomly located in a north-south orientation in the north half of the study area. Along this transect, two 1 m^2 quadrats were randomly located at 1 meter intervals on alternating sides of the transect line. Quadrats located at odd numbered intervals were located on the east side of the transect line; quadrats located at even numbered intervals were located on the west side of the transect line. A random numbers table was used to determine the number of meters the quadrats were located from the transect line. Percent cover of each taxon was determined using the Daubenmire cover class system (Daubenmire 1959), as modified by Bailey and Poulton (1968). Only plants rooted within the frame of the quadrat were recorded. The modified cover scale is as follows: class 1 = 0—1%, class 2 = 1—5%, class 3 = 5—25%, class 4 = 26—50%, class 5 = 51—75%, class 6 = 76—95%, and class 7 = 96—100%. Importance value (IV) for ground cover taxa was determined by summing relative frequency and relative cover.

The Floristic Quality Index (FQI) was determined for the preserve using the coefficient of conservatism assigned to each taxon by Taft et al. (1997). The FQI is a weighted index of the species richness (N), and is the arithmetic product of the average coefficient of conservatism (CC) and the square root of the species richness (√N) of an inventory site [FQI = CC(√N)]. For relatively small areas that are fairly intensively studied floristically, the FQI gives a rapid means of comparison and an indication of the floristic integrity of the site.

RESULTS AND DISCUSSION

A total of 181 vascular plant taxa was observed during the growing season of 2001 (Appendix 1). Of these taxa, one was a fern, one was a gymnosperm, 49 were monocots in 5 families and 29 genera, and 130 were dicots in 41 families and 105 genera. Non-native taxa were rather common, 49 being found on the site, while 16 woody taxa were observed. The families with the largest number of taxa were the Poaceae with 30 taxa, the Asteraceae with 28 taxa and the Cyperaceae with 16 taxa.

Of the taxa found on the study site, 31 (17.3%) occurred in the quadrats (Table 1). Of these taxa, 11 were non-native and four were woody. *Heterotheca camporum* (Greene) Shinners (golden aster) was the dominant species (IV = 39.1), occurring in 96% of the quadrats and having the highest cover. Northern dropseed ranked second in importance value followed by big bluestem, *Melilotus* spp. (sweet clover), *Opuntia humifusa* (Raf.) Raf. (prickly pear), little bluestem, *Ambrosia artemissiifolia* L. (common ragweed), and *Tridens flavus* (L.) Hitchcock (purple top). These taxa were well distributed throughout the study area, with most occurring in at least 40% of the plots.

Sixteen taxa, including royal catchfly, were minor components of the prairie, occurring in only 1 plot (Table 1). Of that number, 2 were non-native taxa and 3 were woody. Another 16 taxa were sampled in less than 10% of the quadrats. Of those taxa, 6 were non-native and 1 was woody.

The floristic integrity of the prairie reconstruction, as measured using the FQI, was 26.8 with a mean Coefficient of Conservatism (CC) of 2.01 when all taxa were included in the calculation. When calculation included only the native taxa, the FQI was 32.2 with a CC of 2.9. The only taxon with a CC greater than 7 was *Silene regia* Sims (royal catchfly). Prairie reconstructions seldom have an FQI of 35 or higher without intensive management (Taft et al. 1997).

Another reason for this reconstruction was to provide a sanctuary for the Illinois endangered plant royal catchfly (Herkert 1991). This tap-rooted perennial with conspicuous crimson corollas was originally known from this part of the state, probably occurring in dry gravel prairies. Seeds from a local roadside population of royal catchfly were collected in the fall of 1992, and the resulting seedlings translocated to the site in October 1993. An additional 25 royal catchfly plants, grown from locally collected seed, were transplanted in the north half of study area in May 2000. Because of unusually dry soil conditions, it is very probable that none of these plants survived beyond a few weeks.

About half of the 25 royal catchfly plants translocated to the site in 1993 persist with 11, 13, and 10 plants being observed in 1998, 1999, and 2001, respectively. Since only the 1999 census was conducted during the peak flowering period, variation in population size can probably be attributed to sampling error rather than natural population fluctuations. A total of 36 stems were observed in 1998 (31 flowering), 64 in 1999 (37 flowering), and 53 in 2001 (42 flowering). The low number of stems observed during the 1998 growing season is probably due to unusually low precipitation during that growing season. Perforation of the seed capsules by insects was noted in every year of monitoring. This damage affected as many as 40% of the capsules in a given year and resulted in the loss of all seed production in those capsules.

Very little information is available concerning the flora of gravel prairies in Illinois. Along the Rock River in northern Illinois, Fell and Fell (1956) listed the consistent grasses on the gravel prairie crests as little bluestem, *Sporobolus heterolepis* (prairie dropseed), and side-oats grama. Big bluestem and Indian grass were restricted to draws and damp spots, while *Panicum virgatum* L. (switch grass) and *Stipa spartea* Trin. (porcupine grass) were even more limited in their distribution. To the northeast in Harrison County, Indiana, the gravel hill prairies have the visual aspect of mid-grass prairie (Post et al. 1985). Here the common grasses are side-oats grama, little bluestem, and porcupine grass, with big bluestem, prairie dropseed, and Indian grass present in more mesic areas.

Other than a few small prairie remnants in cemeteries and along rights-of-way, there is no information available on the floristic composition and structure of the dry gravel prairies in the lower Wabash Valley. As a result, the present management strategies are to remove woody invasive taxa, decrease the number of non-native herbaceous taxa, and increase the number and diversity of native prairie species that are commonly associated with mid-grass prairies on xeric sites in the midwest. It is hoped that the frequent use of fire will increase the abundance of the more xeric grass taxa and will also have a positive effect on the typical prairie forbs and shrubs that have been found in the area.

LITERATURE CITED

Bailey, A. W. and C. E. Poulton. 1968. Plant communities and environmental relationships in a portion of the Tillamook burn, northwestern Oregon. Ecology 49:1—13.

Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43—64.

Edgin, B. 1996. Barrens of presettlement Lawrence County, Illinois. pages 59–65. *In* C. Warwick, editor, Proceedings of the 15th North American Prairie Conference. Natural Areas Association. Bend, Oregon.

Evers, R. A. 1955. Hill prairies of Illinois. Bulletin of the Illinois Natural History Survey 26:367—446.

Fell, E. W. and G. B. Fell. 1956. The gravel hill prairies of Rock River Valley in Illinois. Transactions of the Illinois State Academy of Science 49:47—62.

Fehrenbacher, J. B. and R. T. Odell. 1956. Lawrence County Soils. Soil Report 78. University of Illinois, Agricultural Experiment Station, Urbana, Illinois

Fehrenbacher, J. B., G. O. Walker, and H. L. Wascher. 1967. Soils of Illinois. University of Illinois Agriculture Experiment Station Bulletin 725:1—47.

Gleason, H. A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. 2nd edition. The New York Botanical Garden, Bronx. IXXV + 910 pages.

Herkert, J. R. 1991. (editor) Endangered and threatened species of Illinois: Status and distribution, Volume 1, Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 158 pages.

Hutchison, M. 1988. A guide to understanding, interpreting, and using the public land survey field notes in Illinois. Natural Areas Journal 8:245—255.

Iverson, L. R., G. L.Rolfe, T. J. Jacob, A. S. Hodgins, and M. R. Jeffords. 1991. Forests of Illinois. Illinois Council on Forest Development, Urbana, and Illinois Natural History Survey, Champaign, Illinois.

McFall, D. and J. Karnes. (editors). 1995. A Directory of Illinois Nature Preserves. Vol. 2. Northwestern, Central, and Southern Illinois. Illinois Department of Natural Resources, Division of Natural Heritage, Springfield, Illinois. 321 pages.

Mohlenbrock. R. H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale, Illinois. VII + 507 pages.

Post, T. W., J. A. Bacone, and J. R. Aldrich. 1985. Gravel hill prairies of Indiana. Proceedings of the Indiana Academy of Science 94:457—463.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Springfield, Illinois. 32 pages + map.

Schwegman, J. E. 1988. Flora list for sand and gravel prairie remnants in the Wabash River lowlands of Lawrence County, Illinois. Illinois Department of Natural Resources memo, Springfield, Illinois.

Taft, J. B., G. S. Wilhelm, D. M. Ladd, L. A. Masters. 1997. Floristic quality assessment for vegetation in Illinois, A method for assessing vegetation integrity. Erigenia 15: 3—95.

Transeau, E. N. 1935. The prairie peninsula. Ecology 16:423—437.

White, J. A. and M. H. Mandany. 1978. Classification of natural communities in Illinois, pages 310—405, *in* J. White, Illinois Natural Areas Inventory. Technical Report, Urbana, Illinois.

Table 1. Frequency (%), cover (%), relative frequency, relative cover, and importance value of taxa encountered during sampling at the Allison Gravel Prairie Reconstruction, Lawrence County, Illinois.

Taxa	Freq. (%)	Average Cover	Rel. Freq.	Rel. Cover	IV
Heterotheca camporum	96.0	15.855	15.0	24.0	39.0
Sporobolus asper	74.0	12.870	11.6	19.5	31.1
Andropogon gerardii	43.0	7.270	6.7	11.0	17.7
Melilotus sp.	73.0	3.430	11.4	5.2	16.6
Opuntia humifusa	36.0	6.930	5.6	10.5	16.1
Schizachyrium scoparium	40.0	4.600	6.3	7.0	13.3
Ambrosia artemisiifolia	58.0	2.390	9.1	3.6	12.7
Tridens flavus	40.0	3.050	6.3	4.6	10.9
Sorghastrum nutans	32.0	3.460	5.0	5.2	10.2
Saponaria officinalis	28.0	2.765	4.4	4.2	8.6
Achillea millefolium	20.0	0.415	3.1	0.6	3.7
Artemisia absinthium	6.0	0.780	0.8	1.2	2.0
Erigeron annuus	9.0	0.295	1.4	0.4	1.8
Potentilla simplex	9.0	0.145	1.4	0.2	1.6
Bouteloua curtipendula	7.0	0.360	1.0	0.5	1.5
Others (16 taxa)		1.515	10.9	2.3	13.2
Totals			100.0	100.0	200.0

APPENDIX I

The vascular flora of Allison Gravel Prairie Reconstruction, Lawrence County, Illinois is arranged alphabetically within each taxonomic group. Introduced taxa are indicated by an asterisk (*). The binomial and authority are followed by the collection numbers of Garrard (G) and Edgin (E). A few taxa were observed but not collected because of their presence in low numbers or lack of flowers and/or fruits.

PTERIDOPHYTA

ASPLENIACEAE
Asplenium platyneuron (L.) Oakes; E5108

GYMNOSPERMAE

CUPRESSACEAE
Juniperus virginiana L.; G66

MONOCOTYLEDONAE

COMMELINACEAE
Tradescantia ohiensis Raf.; E4200

CYPERACEAE
Carex annectens Bickn.; E4205
Carex blanda Dewey; E4216
Carex cephalophora Willd.; E4248
Carex conjuncta Boott.; E3887
Carex cristatella Britt.; E4229
Carex festucacea Willd.; E4234
Carex frankii Kunth.; E4245
Carex gracilescens Steud.; E3886
Carex grayi Carey; E4244
Carex grisea Wahlenb.; E4214
Carex stipata Muhl.; E4228
Cyperus filiculmis Vahl.; E4801
Cyperus strigosus L.; E4840
Eleocharis obtusa (L.) R. & S.; G26
Scirpus georgianus Harper; E4224
Scirpus pendulus Muhl.; E4627

LILIACEAE
**Allium vineale* L.; E4207

POACEAE
Agropyron repens (L.) Beauv.; G61
Andropogon gerardii Vitman; E4596
Bouteloua curtipendula (Michx.) Torr.; E4599
Buchloe dactyloides (Nutt.) Engelm.; Observed
**Bromus commutatus* Schrad.; E4616
**Bromus inermis* Leyss.; E4588
**Bromus tectorum* L.: E3885
**Digitaria sanguinalis* (L.) Scop.; E4825
Elymus villosus Muhl.; E4805
Elymus virginicus L.; G16
Eragraotis spectabilis (Pursh.) Steud.; G2
**Festuca pratensis* Huds.; E4222
Hordeum pusillum Nutt.; E4232
Leersia oryzoides (L.) Swartz; G24
Muhlenbergia schreberi J. F. Gmel; E4583
Panicum capillare L.; E4832
Panicum dichotomiflorum Michx.; E4839
Panicum virgatum L.; G9
Paspalum laeve Michx.; G27
**Poa pratensis* L.; E3888
Schizachyrium scoparium (Michx.) Nash.; E4812
**Setaria faberi* Heerm.; E4600
Setaria glauca (L.) Beauv.; G97
**Setaria viridis* (L.) Beauv.; E4745
Sorghastrum nutans (L.) Nash; G20
Spartina pectinata Link; G30
Sphenopholis obtusata (Michx.) Schribn.; E4249
Sporobolus asper (Michx.) Kunth.; E4744
Sporobulus heterolepis (Gray) Gray; E4817
Tridens flavus (L.) Hitchcock; E4595

TYPHACEAE
Typha latifolia L.; E4617

DICOTYLEDONAE

ACANTHACEAE
Ruellia humilis Nutt.; G73

AMARANTHACEAE
Amaranthus albus L.; E4829

APIACEAE
Chaerophyllum procumbens (L.) Crantz.; E3883
Eryngium yuccifolium Michx.; E4586
Sanicula canadensis L.; E4225
**Torilis japonica* (Houtt.) DC.; G91

APOCYNACEAE
Apocynum cannabinum L.; G84

ASCLEPIADACEAE
Asclepias incarnata L.; G68
Asclepias syriaca L.; G85
Cynanchum laeve (Michx.) Pers.; E4597

ASTERACEAE
**Achillea millefolium* L.; E4624
Ambrosia artemisiifolia L.; E4604
Ambrosia trifida L.; E4822
**Artemisia absinthium* L.; E4831
Aster novae-angliae L.; E4826
Aster ontarionis Wieg.; E4833
Aster pilosus Willd.; E4808
Bidens bipinnata L.; E4814
Bidens frondosa L.; E4835
Brickellia eupatorioides (L.) Shinners; E4591
**Centaurea cyanus* L.; G12
Cirsium discolor (Muhl.) Spreng.; E4743
Conyza canadensis (L.) Cronq.; E4809
Echinacea pallida Nutt.; E4581
Erechtites hieracifolia (L.) Raf.; E4830
Erigeron annuus (L.) Pers.; E4199
Eupatorium serotinum Michx.; E4837
Euthamia graminifolia (L.) Salsb.; E4834
Helianthus strumosus L.; E4804
Heterotheca camporum (Greene) Shinners; E4193
**Lactuca serriola* L.; E4598
Liatris aspera Michx.; E4836
Liatris pycnostachya Michx.; E5110
Parthenium integrifolium L.; E4846
Senecio glabellus Poir.; E3882
Silphium terebinthinaceum Jacq.; E4812
Solidago canadensis L.; E4824
**Tragopogon dubius* Scop.; E4220

BIGNONIACEAE
Campsis radicans (L.) Seem.; E4594

BORAGINACEAE
**Buglossoides arvense* (L.) I. M. Johnston; E3877
Hackelia virginiana (L.) I. M. Johnston; E4827

BRASSICACEAE
**Barbarea vulgaris* R. Br.; E3869
**Capsella bursa-pastoris* (L.) Medic.; E4208
**Erysimum repandum* L.; E3880
**Lepidium campestre* (L.) R. Br.; E4215
Lepidium virginicum L.; E4201
**Thlaspi arvense* L.; E3879
**Thlaspi perfoliatum* L.; E3884

CACTACEAE
Opuntia humifusa (Raf.) Raf.; Observed

CAESALPINIACEAE
Cassia fasciculata Michx.; E4603
Cassia marilandica L.; E5112
Gleditsia triacanthos L.; Observed

CAMPANULACEAE
Campanula americana L.; E4579

CAPRIFOLIACEAE
**Lonicera japonica* Thunb.; E5113
**Lonicera maackii* (Rupr.) Maxim.; E4807

CARYOPHYLLACEAE
**Arenaria serpyllifolia* L.; E4230
**Dianthus armeria* L.; E4619
**Lychnis alba* Min.; E4221
**Saponaria officinalis* L.; E4209
Silene antirrhina L.; G63
Silene regia Sims; E4592
**Stellaria media* (L.) Vill.; E3874

CHENOPODIACEAE
Chenopodium album L.; E4828

CONVOLVULACEAE
**Convolvulus arvensis* L.; E4606
**Ipomoea hederacea* (L.) Jacq.; E4820
Ipomoea pandurata (L.) G.F.W. Mey.; E4620

CORNACEAE
Cornus drummondii C.A. Mey.; E4243
Cornus racemosa Lam.; E4802

EUPHORBIACEAE
Chamaesyce maculata (L.) Small; E4813
Croton capitatus Michx.; G35
Euphorbia corollata L.; E4607
Poinsettia dentata (Michx.) Kl. & Garcke; G17

FABACEAE
Dalea purpurea Vent.; E5114
Desmodium illinoense Gray; G72
**Kummerowia stipulacea* (Maxim.) Makino; E4849
Lespedeza capitata Michx.; E4800
**Medicago lupulina* L.; E4194
**Melilotus alba* Medic.; E4212
**Melilotus officinalis* (L.) Pallas; E4213

GERANIACEAE
Geranium carolinianum L.; E4821

LAMIACEAE
Agastche nepetoides (L.) Ktze.; E4823
**Lamium purpureum* L.; E3870
Lycopus americanus Muhl.; G65
Monarda fistulosa L.; G78
**Nepeta cataria* L.; E4237
Physostegia virginiana (L.) Benth.; E4843
Teucrium canadense L. var. *virginicum* (L.) Eat.; E4622

LYTHRACEACE
Rotala ramosior (L.) Kochne; G18

MALVACEAE
**Sida spinosa* L.; E4815

MIMOSACEAE
Desmanthus illinoensis (Michx.) MacM.; E4625

MORACEAE
Humulus lupulus L.; E4803
Morus rubra L.; E4587

NYCTAGINACEAE
**Mirabilis nyctaginea* (Michx.) MacM.; E4819

ONAGRACEAE
Oenothera biennis L.; E4601

OXALIDACEAE
Oxalis dillenii Jacq.; E4582

PHYTOLACCACEAE
Phytolacca americana L.; G44

PLANTAGINACEAE
**Plantago lanceolata* L.; E4580
Plantago virginica L.; G58

POLYGONACEAE
Polygonum pennsylvanicum L.; Observed
**Polygonum persicaria* L.; G92
**Polygonum convolvulus* L.; G38
**Rumex acetosella* L.; E3875
Rumex altissimus Wood.; E4197
**Rumex crispus* L.; E4195

ROSACEAE
Fragaria virginiana Duchesne; E4618
Geum canadense Jacq.; E4613
Geum vernum (Raf.) Torr.; E3876
**Potentilla norvegica* L.; E4612
**Potentilla recta* L.; G11
Potentilla simplex Michx.; Observed
Prunus serotina Ehrh.; Observed
**Rosa multiflora* Thunb.; G80
Rosa palustris Marsh.; G48
Rubus allegheniensis Porter; G81
Rubus pensylvanicus Poir.; E4236

RUBIACEAE
Galium aparine L.; E4233

SALICACEAE
Populus deltoides Marsh.; G70
Salix exigua Nutt.; G56

SCROPHULARIACEAE
Mimulus alatus Ait.; E4611
**Verbascum thaspus* L.; E4589
Veronica peregrina L.; Observed

SOLANACEAE
Physalis subglabrata Mack. & Bush; G29
Solanum carolinense L.; E4206
Solanum ptycanthum Dunal; E4239

ULMACEAE
Celtis occidentalis L.; E4810
**Ulmus pumila* L.; E4217

URTICACEAE
Parietaria pensylvanica Muhl.; E4241

VALERIANACEAE
Valerianella radiata (L) Dufr.; E4238

VERBENACEAE
Verbena stricta Vent.; G6

VITACEAE
Vitis aestivalis Michx.; E4818

ERIGENIA Number 19, September 2003, pp. 60—64

COMPOSITION AND STRUCTURE OF A POST OAK (*QUERCUS STELLATA*) WOODS IN HAMILTON COUNTY, ILLINOIS

William E. McClain[1] and John E. Ebinger[2]

ABSTRACT: A woody vegetation survey of a small section of Cartway Woods was undertaken in 1997. Tree density averaged 395 trees/ha with a basal area of 23.75 m^2/ha. *Quercus stellata* Wang. (post oak) dominated the overstory with an importance value (IV) of 83.5 (200 possible), most individuals in the larger diameter classes. *Carya ovata* (Wang.) K. Koch ranked second with an IV of 46.0, most individuals in the 10—19 cm diameter class. Other species with IV exceeding 24 were *Carya tomentosa* (Nutt.) Nees and *Quercus velutina* Lam. Except for black oak, oak reproduction was poor, indicating that the closed canopy of this woodland favors the more shade-tolerant, fire-sensitive species. The large number of post oak with low branches and branch scars indicate that this woods was more open in the past. Numerous fire scars were present in cut stumps, indicating that fire was important in maintaining an open canopy in settlement times.

INTRODUCTION

Post oak (*Quercus stellata* Wang.) dominated forests were common throughout much of the Midwest from Ohio to Missouri, especially on the Illinoisan glacial till plain (Telford 1926, Braun 1950). Post oak forests occur on barrens with thin soil and exposed bedrock (Ebinger et al. 1994), as well as on flatwoods with heavy clay soils having a claypan near the surface (Coates et al. 1992, Taft et al. 1995). In areas with better drainage, post oak was usually associated with *Q. velutina* Lam. (black oak) and various species of hickory (*Carya* spp.). These post oak forests occur on more mesic sites having greater topographic relief without the edaphic and drainage properties of flatwoods. These forest types are not common in Illinois, and except for some observations by Telford (1926), have not been studied in detail.

Studies indicate that post oak upland forests were relatively open (Anderson and Anderson 1975, Ebinger and McClain 1991). At the time of European settlement, these open canopy forests were maintained by periodic fire (Williams 1989, Davies 1994, McClain and Elzinga 1994). With the cessation of landscape fires, woody plant encroachment resulted in canopy closure (Ebinger 1986, Ebinger and McClain 1991).

The study area is a small section of an extensive block of timber known as Cartway Woods due to the presence of an early 19th Century dirt road, or cartway. The woodlot was the best remaining example of the post oak forest that once was common in Hamilton County. Privately owned, the woodlot was marked for harvest before the authors were aware of the site. A selective timber harvest occurred in the fall of 1997 soon after the completion of our study. The study was undertaken to determine the structure and composition of this woodlot, and to determine the fire history of the site using fire scars data from the cut stumps.

DESCRIPTION OF THE STUDY AREA

Cartway Woods is located in Dahlgren Township, about 19 kms northwest of McLeansboro, Hamilton County, Illinois, in the Mt. Vernon Hill Country Section of the Southern Till Plain Natural Division (Schwegman 1973). Though mostly composed of forest and savanna in presettlement times, extensive prairie inclusions were present (Government Land Office Field Notes Vol. 76).

The woodlot studied is a dry mesic post oak woods about 8 ha in size (NE1/4 Sec 2 T4S R5E). The overall relief does not exceed 7 m, and ranges from 134 m to 141 m above sea level. The soils are Wynoose and Bluford silt loams, which are poorly drained soils that occur on broad, loess-covered till plains (Currie 1986). The climate is continental, characterized by humid, hot summers and cold winters. Average annual precipitation is 105 cm, with a record high of 157.5 cm in 1945 and a record low of 68.3 cm in 1936. The highest temperature on record is 114

[1] 916 West Washington Street, Auburn, Illinois 62615
[2] Emeritus Professor of Botany, Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920

degrees F for July 14, 1936. During an average year, there are 51 days with temperatures greater than 90 degrees F, 104 days with temperatures less than 32 degrees F, and only four days of temperatures below zero. The frost-free growing period averages 184 days (Bryan and Wendland 1995).

METHODS

During the summer of 1997, a 4 ha section of the woodlot was divided into quadrats 25 m on a side. In each quadrat, all living and dead-standing woody individuals 10.0 cm dbh and above were identified to species and their diameters recorded. Living-stem density (stems/ha), basal area (m2/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. Dead-standing stem density (stems/ha), basal area (m^2/ha), and average diameter were also determined for each species.

Woody understory composition and density (stems/ha) were determined using 0.0001, 0.001, and 0.01 ha nested circular plots randomly located at 20 meter intervals along line transects within the study area, two additional 0.0001 ha plots were located 7 m to the east and west of each center. In the 0.0001 ha plot, seedlings (≤50 cm tall) and all shrubs were counted; in the 0.001 ha circular plots, small saplings (>50 cm tall and ≤2.5 dbh) were recorded; and in the 0.01 ha circular plots, large saplings (2.6—9.9 cm dbh) were tallied. Nomenclature follows Mohlenbrock (1986).

During the spring of 1998, cross sections from 40 tree stumps were cut within 30 cm of ground level using a chain saw. These cross sections were prepared for counting using an electric hand planer followed by belt sanding using successively finer sanding grits. Each cross section was aged and fire scars identified to their year of occurrence.

RESULTS AND DISCUSSION

Tree density in the woodlot averaged 395 stems/ha with a basal area of 23.73 m^2/ha (Table 1). Of the 16 arborescent species encountered, post oak ranked first with an IV of 83.5, averaged 104 stems/ha, and accounted for more than 55% of the total basal area (13.54 m^2/ha). Few seedlings and no saplings of post oak were observed (Tables 1 and 2). Most of the large post oaks had an open-grown appearance with low branches or branch scars and broad open crowns. In a survey along two line transects, a total of 50 post oaks greater than 30 cm dbh were examined for lower branches or branch scars. Of these, 42 trees had branch scars or branches within 8 m of the ground; a few had branch scars as low as 1.5 m above the ground, while the average distance was 4 m.

Of the remaining oak taxa, black oak ranked fourth in IV (24.7), most individuals in the 10-19 cm diameter class, and with some seedlings and saplings present (Tables 1 and 2). Other oak species were not common; all had IVs below 3.0 and densities below 8 stems/ha.

Hickories were important components of the woodlot. *Carya ovata* (Mill.) K. Koch (shagbark hickory) and *C. tomentosa* (Poir.) Nutt. (mockernut hickory) ranked second and third in IV due to their high relative densities. They were well represented in the seedling, sapling, and small tree diameter classes (Tables 1 and 2).

The remaining woody species were not plentiful and none had an IV greater than 4.0 or a density greater than 13 stems/ha. Of these, some were common in the seedling and sapling categories, particularly *Sassafras albidum* (Nutt.) Nees (sassafras) and *Prunus serotina* Ehrh. (wild black cherry). The only understory trees present, *Cornus florida* L. (flowering dogwood) and *Morus rubra* L. (red mulberry) were not common (Table 2).

Tree mortality averaged 21.7 stems/ha with a basal area of 1.70 m^2/ha (Table 3). Post oak had the highest mortality, followed by black oak and shagbark hickory. The average diameter of the dead-standing post oak was 36.6 cm, with the largest individual being 75 cm dbh.

If the woodlot had not been cut, post oak would have continued its importance for the near future. However, the relatively few post oaks in the lower diameter classes, as well as the total absence of saplings, suggests that conditions were not favorable for the long term dominance of this taxon. The decrease in oak regeneration is occurring throughout the Midwest, probably due to fire suppression (Ebinger and McClain 1991). The resulting canopy closure favors the growth of shade-tolerant, fire-sensitive species that take advantage of canopy openings as veteran trees die.

Many of the stumps in the woodlot exceeded 200 years in age and contained scars from 101 separate fire events from 1776 to 1991. During this 215 year period there were two major fire intervals: one from 1776 to 1850 when 36 fires were recorded for an average of a fire every 2.08 years; and one from 1886 to 1991 with 65 fires for a fire frequency average of 1.63 years. There was no evidence of fire from 1851 to 1885.

The 101 fires produced 242 fire scars in the cross sections examined. Severe fires—those that scarred 10% or more of the cross sections examined—occurred in 1793, 1804, 1836, 1913, 1914, 1924, 1932, 1936, 1940, 1944, 1953, 1954, 1964, and 1983. Based on weather data from Mt. Vernon, Illinois, located 25 km northwest of the study site, below average precipitation characterized the years 1914, 1924, 1936, 1940, 1944, 1953, 1954 and 1964 (Bryan and Wendland 1995). This extensive fire history of the study site suggests that fire was important in maintaining the open condition of this forest at least until mid 1980s.

ACKNOWLEDGMENTS

The authors would like to thank Terry L. Esker, Illinois Department of Natural Resources, and Bob R. Edgin, Illinois Nature Preserves Commission, for help in cutting the stumps.

LITERATURE CITED

Anderson, R. C. and M. R. Anderson. 1975. The pre-settlement vegetation of Williamson County, Illinois. Castanea 40:345—363.

Braun, E. L. 1950. Deciduous forests of eastern North America. Hafner Publishing Company, New York.

Bryan, A. A. and W. Wendland. 1995. Local climatological data summary, Mt. Vernon, 1895—1994. SWS Miscellaneous Publication 98-20. Illinois State Water Survey, Illinois Department of Natural Resources. Champaign, Illinois. 18 pages.

Coates, D. T., K. J. Lyman and J.E. Ebinger. 1992. Woody vegetation structure of a post oak flatwoods in Illinois. Castanea 57:196—201.

Currie, B. 1986. Soil survey of Hamilton County, Illinois. United States Department of Agriculture, Washington, D.C.

Davies, K. M., Jr., 1994. Some ecological aspects of northeastern American Indian agroforestry practices. Northern Nut Growers' Association Annual Report 85:25-37.

Ebinger, J. E. 1986. Sugar maple, a management problem in Illinois forests? Transactions of the Illinois State Academy of Science 79:25—30.

Ebinger, J. E. and W. E. McClain. 1991. Forest succession in the prairie peninsula of Illinois. Illinois Natural History Survey Bulletin 34:375—381.

Ebinger, J. E., R. Buhrmester and W. E. McClain. 1994. Vegetation of some post oak barrens in Saline County, Illinois. Pages 335—339 in J. S. Fralish, R. C. Anderson, J. E. Ebinger and R. Szafoni (editors), Proceedings of the North American Conference on Savannas and Barrens: living in the edge. Normal, Illinois.

McClain, W. E. and S. L. Elzinga. 1994. The occurrence of prairie and forest fires in Illinois and other midwestern states, 1679—1854. Erigenia 13:79—90.

Mohlenbrock, R. H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois Nature Preserves System. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois.

Taft, J. B., M. W. Schwartz and L. R. Phillippe. 1995. Vegetation ecology of flatwoods on the Illinoisan till plain. Journal of Vegetation Science 6:647—666.

Telford, C. J. 1926. Third report on a forest survey of Illinois. Illinois Natural History Survey Bulletin 16:1—102.

Williams, M. 1989. Americans and their forests: a historical geography. Cambridge University Press, New York.

Table 1. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of woody species in Cartway Woods, Hamilton County, Illinois.

	Diameter classes (cm)						Total	Basal area	Rel	Rel		Avg diam
	10-19	20-29	30-39	40-49	50-59	60-69	stems/ha	m^2/ha	dens	dom	IV	(cm)
Quercus stellata	7.3	25.0	24.8	25.0	16.0	6.3	104.4	13.54	26.5	57.0	83.5	38.4
Carya ovata	106.0	18.3	5.0	1.0	0.3	--	130.6	3.05	33.2	12.8	46.0	16.0
Carya tomentosa	47.3	15.8	5.5	1.8	0.5	--	70.9	2.40	18.0	10.1	28.1	18.9
Quercus velutina	28.3	7.0	3.3	1.3	3.3	3.3	46.5	3.09	11.7	13.0	24.7	24.2
Sassafras albidum	13.0	--	--	--	--	--	13.0	0.16	3.3	0.7	4.0	12.8
Carya glabra	0.8	1.0	1.5	1.8	0.3	--	5.4	0.53	1.3	2.2	3.5	33.9
Quercus rubra	5.8	1.8	0.3	--	--	--	7.9	0.18	2.0	0.8	2.8	16.7
Quercus alba	0.3	--	0.3	0.5	0.8	0.3	2.2	0.41	0.5	1.7	2.2	48.3
Prunus serotina	5.0	1.0	--	--	--	--	6.0	0.11	1.5	0.5	2.0	15.1
Others (7 species)	6.8	0.5	0.3	--	0.5	--	8.1	0.28	2.0	1.2	3.2	
Totals	220.6	70.4	41.0	31.4	21.7	9.9	395.0	23.75	100.0	100.0	200.0	

Table 2. Density (stems/ha) of the seedlings, small saplings, and large saplings in Cartway Woods, Hamilton County, Illinois.

Species	Seedlings (≤50 cm tall)	Small saplings (>50 cm tall/ ≤2.5 cm dbh)	Large saplings (2.6—9.9 cm dbh)
Sassafras albidum	1562.5	703.1	71.9
Prunus serotina	1250.0	343.8	6.3
Carya ovata	937.5	609.4	270.4
Carya tomentosa	781.3	296.9	143.8
Quercus velutina	781.3	328.1	35.9
Fraxinus pennsylvanica	312.5	296.9	7.9
Diospyros virginiana	312.5	93.8	17.2
Cornus florida	156.3	140.7	21.9
Quercus stellata	156.3	--	--
Quercus alba	156.3	31.3	4.7
Quercus imbricaria	156.3	31.3	4.7
Ulmus Americana	--	31.3	20.3
Quercus rubra	--	15.6	3.1
Morus rubra	--	--	6.3
Total	6562.8	2922.2	614.4

Table 3. Density (stems/ha), basal area (m^2/ha) and average diameter (cm) of the dead-standing trees in Cartway Woods, Hamilton County, Illinois.

Species	Density (stems/ha)	Basal area (m^2/ha)	Average diameter (cm)
Quercus stellata	10.8	1.28	36.6
Quercus velutina	4.3	0.26	23.1
Carya ovata	2.0	0.02	11.6
Carya tomentosa	1.0	0.09	30.9
Prunus serotina	1.5	0.03	17.2
Sassafras albidum	1.0	0.01	12.1
Others	1.1	0.01	--
Totals	21.7	1.70	

Illinois Flora Updates:
New Distribution Records and other Noteworthy Finds
by INPS Flora Update Committee

Illinois flora updates is a new feature in *Erigenia* and we hope it becomes a regular feature in subsequent issues. We propose this feature as a solution to several problems: 1) many new distribution records, especially county distribution records, are never published; 2) there have been rediscoveries of many species and populations considered rare or extirpated but not tracked by the Illinois Endangered Species Protection Board; 3) several non-native plant species are now spreading explosively across Illinois and parts of North America; and 4) no one individual in Illinois is tracking or verifying all new finds and rediscoveries. We hereby initiate this feature with the hope that it will act as a clearinghouse for new and updated information on the distribution of plants in Illinois, and thus stimulate further botanical discoveries and floristic work in Illinois.

The first published compilation of vascular plant distribution by county for Illinois was in 1955 (Jones and Fuller 1955), with added records in 1960 (Winterringer and Evers 1960). In the past, *Erigenia* has published updates (Mohlenbrock and Ladd 1983; Mohlenbrock 1985) to Distribution of Illinois Vascular Plants (Mohlenbrock and Ladd 1978). Recent works on the Illinois vascular flora have generally lacked precise information on species distribution (Mohlenbrock 2002) or deal with a limited region of Illinois (Swink and Wilhelm 1994) or one plant family (Lynn 2001). Recent publications in the Transactions of the Illinois State Academy of Science (Basinger 2001; Ketzner 1996; Wilm and Taft 1998e) have publicized species new to Illinois, but generally have omitted new distribution records of species previously known from the state. In few cases, recently published floristic studies require close reading to determine if any new distribution records were made!

At present, we want the updates to focus on vascular plants (flowering plants, conifers, ferns, and fern allies). This is the only group for which state-wide distribution data are widely available, primarily through the publications cited in the previous paragraph. We will also summarize publications elsewhere concerning additions to the Illinois flora, where pertinent collection data are included. We request that authors inform us of the new finds (after publication, of course) with relevant information. Given the current lack of stability in scientific names, we also propose to alert Illinois plant enthusiasts to published changes in these names. We will provide a citation and, if possible, a brief statement citing the reason for these changes.

We hope this feature will assist in tracking the spread of non-native plants. At present, many widespread exotics are under-recorded, and we encourage the collection of voucher specimens to document this spread. Among the under-collected exotics are two invasive shrubs, autumn-olive (*Elaeagnus umbellata*) and the Amur or red honeysuckle (*Lonicera maackii*); they may now be present in every county. We also need documentation for certain invasive species that are now just arriving in Illinois or will probably appear here within the near future, such as giant hogweed (*Heracleum mantegazzianum*) or mile-a-minute (*Polygonum perfoliatum*). As human-mediated climate and landscape change proceeds, this feature could become an invaluable resource for land managers and invasive species biologists.

We will only accept records that are based on voucher specimens deposited at an institutional herbarium. We strongly suggest the herbaria of the Illinois Natural History Survey (all Illinois plants) and Morton Arboretum (plants collected in northeastern Illinois) as appropriate places to deposit specimens. Their addresses are included below. Other herbaria that specialize in the Illinois flora include those at Illinois' universities and large colleges, museums (Field Museum and Illinois State Museum), and public gardens (Chicago Botanical Garden and Missouri Botanical Garden).

The only exception to the above restriction will be made for certain endangered, threatened, or otherwise rare species, for which an archival photograph should be presented to a herbarium as a voucher. Two good rules of thumb for vouchering rare herbaceous species are: 1) do not collect a specimen if the population is below twenty individuals; and 2) do not collect an entire plant unless the population is above fifty individuals (or stems). Hopefully, this will also prompt a more careful survey of the population and its environs for additional plants and will result in a more accurate population census. We also encourage all botanists (both professional and amateur) to limit collections of rare species to the minimal material needed to confirm the plant's identity. We will not publish sight records, aside from rediscoveries of previously verified populations belonging to species of conservation concern (listed as federal T&E, state E&T, FS sensitive species (USDA FS, on Midewin and Shawnee). All other records must be accompanied by a specimen or verifiable photograph.

When collecting known or potentially invasive species, carefully dispose of any viable seed not incorporated into the specimen; please do not unintentionally assist in the spread of exotics! We may question reports (even with vouchers) of certain cultivated plants reported as "new to Illinois" or "new to _____ County"; we don't want this feature to become a horticultural record for Illinois. Only genuine escapes and plants persisting long after cultivation (>40 years) at abandoned house sites and gardens should be considered part of the spontaneous flora. For supplementary opinions on the rationale and ethics involved in plant collecting, read Raviell (1982) and Stritch (1982). Be aware that wild plants belong to the landowner, and we recommend obtaining written permission before collecting on private land. It is illegal to collect in nature preserves and most other public lands without a permit.

There are several publications available on the proper methodology and equipment for collecting voucher specimens (Hill 1996; Oskins 1982; Robertson 1980; Smith 1971). These publications also include some sources of plant presses and other equipment, and the Internet is another source with on-line catalogs for plant collecting and herbarium supplies. Several textbooks on plant taxonomy and systematics also include information on making plant specimens.

All records *(not specimens)* should be mailed (hard copies or electronic mail) to:

Illinois Flora Updates
Erigenia Editor

4252 Humphrey Street
St. Louis, Missouri 63116
mvogt@accessus.net

The editor will forward the records to the INPS Flora Updates coordinator a few months before publication of Erigenia. The coordinator will work with botanists at the Illinois Natural History Survey and other institutions to confirm the significance of these reports. The coordinator will then organize the reports into a format suitable for Erigenia.

We recommend that all submissions should include the following information. If any of the fields below marked with an asterisk is omitted, we may refuse to publish the record.

- Scientific name*
- The identification manual or source of nomenclature being used* (Mohlenbrock 2002, Swink and Wilhelm 1994, Yatskievych 1999, or others)
- Common name
- Family
- County*
- Date of collection* (or sighting, for species of conservation concern)
- Collector's name*
- Collection number*
- Herbarium* where specimen or copy of photograph is deposited
- Accession number (from herbarium where specimen is deposited; we highly recommend including this number, if available)
- Locality information (legal location, township, state park, forest preserve, or national forest should be included; however, precise locality info will be omitted for rare plants or those vulnerable to unsustainable harvest, e.g., orchids, goldenseal, or ginseng).
- Habitat, can include associates.
- Comments on population size (especially if the species is of conservation concern).
- If the information is published in full elsewhere, please cite publication.*
- Significance – a brief statement or short paragraph discussing the importance of this find. Is this a new state record, a new county record, a major range extension, a rare species, the rediscovery of a historic specimen, or a rapidly spreading exotic? (If this discussion is lengthy, we will edit it.)
- Please indicate whether the plants are native or alien (non-native). Be aware that plants native in one part of Illinois may be escaping from cultivation in other regions (e.g., redbud).

Please include your telephone number, e-mail address, or postal address so the coordinator can contact you if any questions arise. At present, there will not be any page charges for publishing records.

Herbaria:

Dr. L. R. Phillippe, Herbarium Manager
Center for Biodiversity
Illinois Natural History Survey
607 East Peabody
Champaign IL 61820

Herbarium Curator
Research Department
The Morton Arboretum
Lisle IL 60532

Literature Cited:

Basinger, M. A. 2001. Additions to the vascular flora of Illinois. Transactions of the Illinois State Academy of Science 94:199-205.

Hill, S. R. 1995. How to Make a Plant Collection. 8 pp. Herbarium Supply Company, Menlo Park CA (photocopied).

Jones, G. N., and G. D. Fuller. 1955. Vascular Plants of Illinois. University of Illinois Press, Urbana-Champaign. 593 pp.

Ketzner, D. M. 1996. *Crepis pulchra* (Asteraceae) and *Moenchia erecta* (Caryophyllaceae) in Illinois. Transactions of the Illinois State Academy of Science 89:21-23.

Lynn, K. W. 2001. Additions to the orchid flora of Madison County, Illinois. Transaction of the Illinois State Academy of Science 94:207-211.

Mohlenbrock, R. H. 1985. Illinois Flora Update: New Distribution Data for Illinois Vascular Plants II. Erigenia 5:53-64.

Mohlenbrock, R. H. 2002. Vascular Flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville. 491 pp.

Mohlenbrock, R. H., and D. M. Ladd. 1978. Distribution of Illinois Vascular Plants. Southern Illinois University Press, Carbondale and Edwardsville. 282 pp.

Mohlenbrock, R. H., and D. M. Ladd. 1983. New Distribution Data for Illinois Vascular Plants. Erigenia 3:2-21.

Oskins, W. 1982. Collecting plant specimens. Erigenia 1:9-21.

Raveill, J. 1982. Why collect plant specimens? Erigenia 1-2-6.

Robertson, K. R. 1980. Observing, Photographing, and Collecting Plants. Illinois Natural History Survey Circular 55. Urbana Illinois. 62 pp.

Smith, C. E., Jr. 1971. Preparing Herbarium Specimens of Vascular Plants. Agricultural Information Bulletin No. 348. United States Department of Agriculture, Washington DC.

Stritch, L. R. 1982. The ethics of plant collecting. Erigenia 1:7-8.

Swink, F., and G. Wilhelm. 1994. Plants of the Chicago Region, 4th edition. Indiana Academy of Science, Indianapolis. 921 pp.

Wilm, B. W., and J. B. Taft. 1998. *Trepocarpus aethusae* Nutt. (Apiaceae) in Illinois. Transactions of the Illinois State Academy of Science 91:53-55.

Winterringer, G. S., and R. A. Evers. 1960. New Records for Illinois Vascular Plants. Illinois State museum Scientific Papers Series. Vol. XI. Urbana. 135 pp.

Yatskievych, G. 1999. Steyermark's Flora of Missouri, Volume 1. Missouri Department of Conservation, Jefferson City. 991 pp.

Invitation for Submission of Articles

NIA is a peer-reviewed journal of the Illinois Plant Society. We invite the submission of l articles on the biota of Illinois and adjacent This is a partial list of articles of interest to members.

OMY of vascular plants, fungi, lichens, and

GY of native species and plant communities; tions and effects of birds, mammals, and insects ecosystem

AL HISTORY of our state, including geology and phy

BOTANY of native plants, their use by Native ans

RAL HISTORY as it intersects with natural history

ISTS, SCIENTISTS, EXPLORERS, and BOTANICAL S who have played a major role in our tanding of our state and its natural resources

RATION of our native landscapes, management ques and results

CULTURE as it relates to native plants in restored ural environments

nuscripts and communications should be the editor:

Marty Vogt
4252 Humphrey Street
St. Louis, Missouri 63116
mvogt@accessus.net
314-771-7593

Instructions for Authors

Authors may submit material either electronically or through the postal service. Authors should retain copies of all material submitted.

1) If manuscripts are submitted in paper form, then three copies should be provided. Text format must be in a single font, double-spaced and left-justified. See mailing address in the column to the left.
2) If manuscripts are submitted electronically, they may be provided on diskette or sent as an e-mail attachment. See e-mail address in the column to the left. Only MS Word documents can be accepted electronically. Manuscripts must be in a single font and left-justified.

The title page of the manuscript should state the affiliation and complete addresses of all the authors; the telephone number of the corresponding author should also be supplied. All papers will be reviewed and copy-edited.

Abstracts

Research and technical papers should include a one-paragraph abstract of not more than 250 words. The abstract should state concisely the goals, principal results, and major conclusions of the paper.

Taxonomic Names

Either a standard taxonomic manual should be cited whose names are followed consistently, or the scientific names should be followed by their authority. Common names, if used, should be referenced to a scientific name. Thereafter, scientific names are recommended, but either may be used if done so consistently.

Proofs

Authors will have the opportunity to review their articles before publication and are expected to correct any errors. The proofs should be returned within one week of receipt.

Page Charges

Page charges of $15 for members and $25 for non-members will be assessed. The fee will be waived for those who sign a statement that they neither have institutional support for publication nor can afford the page charges.

ILLINOIS NATIVE PLANT SOCIETY
FOREST GLEN PRESERVE
20301 EAST 900 NORTH ROAD
WESTVILLE, ILLINOIS 61883

RETURN SERVICE REQUESTED

CONTENTS

ERIGENIA 19, OCTOBER 2003

ERIGENIA

Number 20
October 2004

Journal of the
Illinois Native Plant Society

ERIGENIA

Number 20, October 2004

The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

COVER ILLUSTRATION
Drawing of *Tilia americana,* basswood, by Nancy Hart-Stieber of The Morton Arboretum, Lisle, Illinois. Copyright 1978 by The Morton Arboretum.

MEMBERSHIP
Yearly membership includes a subscription to *Erigenia* and the quarterly newsletter, *Harbinger*. For more information, visit our website at www.ilnps@aol.com or write to

Illinois Native Plant Society
Forest Glen Preserve
20301 East 900 North Road
Westville, Illinois 61883
e-mail: ilnps@aol.com

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August, 1982.

(ISSN 8755-2004)

ERIGENIA

NUMBER 20, OCTOBER 2004

TABLE OF CONTENTS

About Our Authors

Roger Beadles is a naturalist and owner of Beadles Barrens Nature Preserve. His interests are in the response of natural areas and rare plant populations to applied management techniques.

Tiffany S. Bone is currently a graduate student in Plant Biology at University of Illinois at Champaign-Urbana, working under the direction of Dr. Steven Downie on the systematics of the Apiaceae. She received her B.A. in Plant Biology from Southern Illinois University at Carbondale, where she worked on bryophyte ecology and the molecular systematics of parasitic plants.

Matt S. Burmeister is an M.S. candidate in the Department of Biological Sciences at Eastern Illinois University under the direction of Dr. Scott Meiners. His research interests primarily focus on the integration of ecological principles into prairie restoration.

Janice M. Coons is a botany professor at Eastern Illinois University and is active in the Illinois State Academy of Science and the Botanical Society of America. She teaches botany classes including plant physiology and horticulture. Her research involves the reproductive biology of endangered and threatened plants as well as the use of native plants in landscaping.

Mary Cooprider worked for three years as a soil scientist with the Illinois Natural History Survey in Champaign, Illinois. She is currently a water quality specialist with National Park Service and is working in the San Francisco area.

Bob Edgin is a field representative for the Illinois Nature Preserves Commission. His research focuses on the structure and composition of forest and prairie communities and population dynamics of endangered plant species within Illinois nature preserves.

John E. Ebinger is emeritus professor of botany at Eastern Illinois University. His research focuses on the structure and composition of forest, glade, and sand prairie communities in Illinois as well as the tropical genus *Acacia*.

Brian J. Fischer, DDS, was working on a B.S. in zoology at Eastern Illinois University at the time of the *Silene regia* research. He then went to dental school at the University of Illinois in Chicago. He currently lives in Columbia, Missouri, and is the dental director of the Family Dental Center, a not-for-profit company.

Nicolette L. Flocca completed her B.S. in Natural Resources and Environmental Sciences at the University of Illinois, Urbana-Champaign, where her undergraduate experiences included rare plant germination, caddisfly diversity and abundance, effects of air pollution on lichens in northern Indiana, development of a snake reintroduction plan for the Chicago Botanic Garden, and participation in a boa constrictor tracking study in Ometepe, Nicaragua, documented by National Geographic. She is currently studying the effects of prairie habitat quality on snake populations in northern Illinois as she works towards her Ph.D. at Duke University.

David M. Ketzner is a botanist/ecologist in the Wetlands Group at the Illinois Natural History Survey. His responsibilities are wetland delineation, evaluation of potential wetland mitigation sites, and monitoring of created wetlands, primarily for Illinois Department of Transportation project sites. The vascular flora and lichens of Illinois are his primary research interests.

Scott Kobal is the plant ecologist with the Forest Preserve District of DuPage County, a position he has held since 1990. Scott obtained his B.S. and M.S. degrees in wildlife management from the University of Wisconsin-Stevens Point. He is responsible for assessing and inventorying Forest Preserve lands as well as conducting several long-term monitoring studies of local plant communities.

Vernon LaGesse, Jr., owner of LaGesse & Associates, Inc., has been conducting stewardship restorations for 14 years. Current projects include maintenance of landfill caps with native vegetation, controlled burns, and prairie, wetland and woodland restoration.

Wayne Lampa was raised in Wheaton, Illinois, and received a B.A. in Physical Geography from Northern Illinois University and an M.A. in Geomorphology from Louisiana State University. He worked for the Forest Preserve District of DuPage County for 25 years and currently works as an independent ecologist.

Richard Larimore is a wetland ecologist with the Illinois Natural History Survey in Champaign, Illinois. He is interested in fire ecology, particularly as fire relates to species composition in woodlands.

William E. McClain is an adjunct research associate in botany at the Illinois State Museum in Springfield, Illinois. His interests include forest and prairie ecology, exotic species, and rare plants.

Scott J. Meiners is an assistant professor in the Department of Biological Sciences at Eastern Illinois University. His research focuses on plant community ecology, particularly on the dynamics of successional systems and the causes and consequences of exotic plant invasions.

Andrew S. Methven is professor and chair in the Department of Biological Sciences at Eastern Illinois University. His research focuses on systematics and ecology of fleshy fungi and lichens.

Henry R. Owen has been a botany professor at Eastern Illinois University for the past ten years, teaching a wide range of courses for majors, non-majors, and M.S. students. His research areas include plant physiology, genetics, and tissue culture. He is also the national president of Phi Sigma, the biological sciences honor society.

Gordon C. Tucker, an associate professor at Eastern Illinois University, teaches courses in plant taxonomy, plant morphology, dendrology, aquatic plants and ethnobotany. He received his Ph.D. from Duke University and specializes in the taxonomy of grasses and sedges. He recently published a treatment of *Cyperus* and related genera for Flora of North America.

Brent Wachholder has a B.S. in Biological Sciences and is currently completing his M.S. at Eastern Illinois University. He is a lifelong Illinois native.

Jennifer Ward, native of Macon County, received her A.S. degree from Richland Community College, and her B.S. and M.S. from Eastern Illinois University. She has worked for several years as a naturalist at the Macon County Conservation District.

Erigenia, Number 20, October 2004, pp 3—8

Generalist Herbivore Preferences Between the Exotic *Lonicera maackii* (Rupr.) Maxim. and Selected Native Caprifoliaceae in Illinois

Tiffany S. Bone[1] and Scott J. Meiners[2]

Abstract: The exotic shrub *Lonicera maackii* (Rupr) Maxim. (Amur honeysuckle) has become the dominant shrub in many forests of the midwestern United States. Decreased herbivory on exotic species relative to native species, often referred to as the enemy release hypothesis, has been used to explain the differential success of exotic species in many invaded plant communities. The goal of this research was to determine whether the increased dominance of *Lonicera maackii* in regional forests could be explained by selective herbivory by the land snail *Anguispira alternata* (Say), a generalist herbivore. To assess the importance of the enemy release hypothesis, we experimentally compared herbivore preferences among *Lonicera maackii* and three native shrubs, all belonging to the family Caprifoliaceae. *Lonicera maackii* had consistently low levels of herbivore damage and showed significantly less damage than two of the three native shrubs tested. These results are consistent with the enemy release hypothesis and suggest that differential herbivore pressure from generalist herbivores may contribute to the relative success of *L. maackii*, as well as other exotic plants, over their native relatives.

Introduction

The enemy release hypothesis is one of several mechanisms that has been proposed to explain the success of contemporary invasions in native plant communities. The hypothesis is based on the observation that exotic species often have fewer herbivores and natural enemies than native species (Blossey and Notzold 1995; Keane and Crawley 2002). This decrease in herbivore load is thought to occur because native organisms are not adapted to utilize the invading species and the natural predators of the exotic were not introduced from its native range. Lack of herbivory, therefore, results in increased success of the exotic species relative to native species, which are susceptible to their own natural enemies (Keane and Crawley 2002).

Invasive exotic plants are often noted as being more competitive than native species (Dillenburgh et al. 1993; Fogarty and Facelli 1999; Callaway and Aschehoug 2000). This competitive superiority may be partly explained by preferential herbivory. Herbivory can shift competitive outcomes from a competitively superior species to a competitively inferior species that is subjected to less herbivore damage (Louda 1989; Clay et al. 1993; Hulme 1996b). If exotic species are generally subjected to lower rates of herbivory than natives, they may show relatively greater competitive abilities.

Traditionally, the enemy release hypothesis has been invoked to explain the lack of herbivory on exotic plant species by specialist herbivores (Wolfe 2002; Keane and Crawley 2002). This hypothesis has been extended to include generalist herbivores (Keane and Crawley 2002). This extension proposes that exotic plants may be less palatable than native species to herbivores overall, not just because they lack specialist herbivores. Therefore, exotic species should show reduced herbivory by generalist herbivores when compared to their native counterparts. Because generalist herbivores occur in all habitats and often in large numbers, their preferences may be more important than specialist herbivores in structuring plant community composition.

[1]Department of Plant Biology, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801
[2]Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920, author for correspondence

Grazing by slugs and snails can be extremely important in determining community composition and dynamics (Weiner 1993; Hanley et al. 1995a; Hanley et al. 1996; Nystrand and Granström 1997; Scheidel and Bruelheide 1999). While terrestrial gastropods are generalist herbivores, they also show strong feeding preferences (Nystrand and Granström 1997; Fenner et al. 1999; Peters et al. 2000). Selective grazing on vulnerable seedlings may influence the number and proportions of the species present and is thought to shape plant community composition in many different ecosystems (Hanley et al. 1995a; Hulme 1996a; Fenner et al. 1999). Furthermore, selective herbivory by a generalist herbivore can shift competitive superiority from palatable to unpalatable species, leading to changes in dominance (Louda 1989; Hanley et al. 1995a; Hulme 1996b).

To date, relatively few studies have examined the importance of feeding preferences in facilitating exotic plant invasion into plant communities (Keane and Crawley 2002). The objective of this study was to test the enemy release hypothesis using a generalist snail herbivore. We experimentally compared feeding preferences by a generalist snail herbivore between an exotic shrub species and local confamilial relatives. The enemy release hypothesis, as put forward by Keane and Crawley (2002), predicts that the generalist herbivore should prefer the native species to the exotic.

MATERIALS AND METHODS

Study species

Lonicera maackii (Rupr.) Maxim (Amur honeysuckle), is a shade intolerant shrub that grows well on forest edges and open woodlands, especially those that have been subjected to human or animal disturbances (Luken and Goessling 1995; Hutchinson and Vankat 1998). Like many non-indigenous species, *Lonicera maackii* negatively impacts native species, presumably through competition for light, water, and nutrients (Trisel 1997; Hutchinson and Vankat 1997; Gould and Gorchov 2000).

We compared feeding preferences of a generalist snail herbivore among the exotic shrub *Lonicera maackii* and three species of native shrubs, *Sambucus canadensis* L., *Symphoricarpos orbiculatus* Moench, and *Viburnum dentatum* L. These species are members of the Caprifoliaceae, have bird-dispersed fruits, and commonly share wooded habitats of the region. Some local populations of *Sambucus canadensis* have been shown to have cyanogenic herbivore defenses, though this is quite variable (Buhrmester et al. 2000).

We used *Anguispira alternata* Say, the striped wood snail, as the generalist herbivore in our experiments. This species has been considered to be the most abundant land snail in Illinois, occurring over a large area and in a wide range of habitats, including forests (Baker 1939), suggesting that it is a generalist herbivore. In previous laboratory work, it has shown strong feeding preferences between plant species (S. Meiners, pers. obs.). The snails used in these experiments were from a laboratory culture of locally collected snails that had been maintained for approximately one year. Snail populations were maintained in 10-gallon terraria (25 cm × 50 cm × 30 cm high) with a 3 cm layer of cypress mulch that was kept moist at all times with deionized water. Snails were fed weekly with various types of lettuce and were provided with petri dishes filled with plaster of Paris to provide minerals for shell development. Cultures were cleaned and divided twice a year to maintain reasonable densities within the terraria. Under these conditions, *A. alternata* grew well and reproduced freely.

Experimental design

We tested herbivore preferences using paired-choice feeding trials within a lab setting. These types of studies are commonly used to assess relative palatability and tend to reflect patterns of herbivory seen in natural systems (Scheidel and Bruelheide 1999; Fritz et al. 2001; Fortin and Mauffette 2002). Feeding trials took place from 25 June to 3 July 2002 in four 10-gallon glass terraria. The bottom of each tank was covered with a layer of shredded cypress mulch approximately 3 cm thick. All material was kept moist with deionized water throughout the feeding trials. Separate trials were conducted for each of the three comparisons.

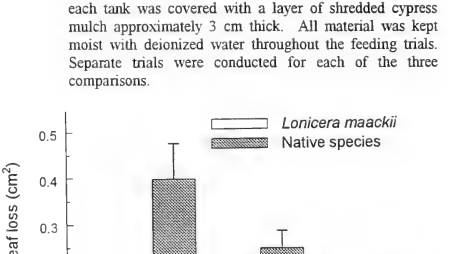


Fig. 1) Removal of leaf tissue by the snail *Anguispira alternata* in three preference trials. The exotic *Lonicera maackii* (unshaded bars) is compared to the paired native species (shaded bars). Statistical comparisons are made within each pair-wise trial only. Bars are mean ±1 standard error.

Table 1. ANOVA analyses of herbivore preferences between *L. maackii* and three native shrubs as measured by consumption of leaf tissue by the generalist herbivore *Anguispira alternata*. Block effect tests variation among test terraria.

Native test species	DF	MS	F	P	R^2
Symphoricarpus orbiculatus					
Species	1	1.67	13.84	0.001	0.52
Block	3	0.28	2.36	0.079	
Species x Block	3	0.57	4.72	0.005	
Error	72	0.12			
Sambucus canadensis					
Species	1	0.32	9.19	0.003	0.58
Block	3	0.07	2.08	0.110	
Species x Block	3	0.06	1.83	0.150	
Error	72	0.03			
Viburnum dentatum					
Species	1	0.32	0.81	0.370	0.37
Block	3	0.18	3.17	0.030	
Species x Block	3	0.14	2.37	0.078	
Error	71	4.06	0.06		

Within each of the four tanks, we placed ten individuals of *Anguispira alternata* of approximately the same size. Snails were not fed for 48 hours before each feeding trial. Immediately before each feeding trial, leaves of *L. maackii* and one of the native species were collected from local woodland populations in Coles County (Illinois). Leaves were selected to be of similar size and without previous herbivore damage. All leaves were kept in sealed plastic bags with deionized water to prevent desiccation until the herbivory trials began.

Ten leaves of each species (*L. maackii* and a native) were placed in each of the four tanks for each trial in two separate rows along the long axis of the aquaria. In the case of *Sambucus canadensis*, which has compound leaves, individual leaflets were used. Snails were introduced to the center of the tank and allowed to feed for a total of 72 hours. Leaf area was determined to the nearest 0.1 mm^2 for each leaf with a LI–3100 area meter (LICOR Inc., Lincoln, NE) before and after exposure to herbivory to determine the area removed by the herbivores. Tanks were misted with deionized water daily to prevent desiccation of the leaves and to maintain high humidity. ANOVA was used to compare the amount of leaf area removed between species in each trial and to control for the influence of individual tanks using SPSS (SPSS Inc., Version 11.0.1, Chicago, Illinois).

RESULTS

Across all three experimental feeding trials, *L. maackii* had consistently low amounts of leaf area removed by *A. alternata* (Fig. 1) with an average leaf loss of 0.11 cm^2 (1% of tissue removed). However, the native comparison species varied in their palatability to the native herbivores, with leaf area removal ranging from 0.40 cm^2 in *Symphoricarpos orbiculatus* to 0.16 cm^2 in *V. dentatum*. ANOVA analyses showed significant differences between *L. maackii* and two of the native shrub species, *Symphoricarpos orbiculatus* and *Sambucus canadensis* (Table 1). While showing slightly greater amounts of leaf removal than *L. maackii*, a significant difference between species was not observed in the *V. dentatum* trials. Two species, *Symphoricarpos orbiculatus* and *V. dentatum*, showed significant block, or species × block interaction effects. These effects can be attributed to tanks in which the herbivores did not feed on one or both species. The reason for lack of feeding in some tanks is not clear. In no case did the relative preference switch among tanks.

These results were qualitatively similar to those calculated from percent of leaf area removed. However, as initial leaf area was not significantly associated with amount of leaf tissue removed in any trial for either species (Spearman rank-sum correlations all $P > 0.05$) and because of the statistical problems associated with the analysis of proportions, we have chosen to present only absolute removal data.

DISCUSSION

The extension of the enemy release hypothesis to include the action of generalist herbivores is supported by this work (Keane and Crawley 2002). While a newly invading species would probably escape the specialist herbivores present within its original native range, generalist herbivores should be present in all habitats. Including generalist herbivores as a mechanism of invasion success makes herbivory a potentially important process in the successful invasion of many species, even those with no known specialist herbivores. It is not known, however, if generalist herbivores in the introduced range of a plant species react differently to the plant species than do generalist herbivores within its native range.

Our results indicated significant preference by *Anguispira alternata* for two of the three native taxa, *Symphoricarpos orbiculatus* and *Sambucus canadensis*, over *Lonicera maackii*. Similarly, Trisel (1997) found that woodland populations of *L. maackii* were subjected to less herbivore damage than co-occurring woody species. Our laboratory feeding trials suggest that relative palatability may be responsible for these differences in natural populations. Therefore, differential herbivore pressure may help to explain the relative success of this exotic species over native taxa.

This study was conducted using mature plant tissues. Because defensive chemistry often changes with the maturation of a plant, generalist herbivores often change their responses to seedlings and mature plants of the same species (Hanley et al. 1995b; Fenner et al. 1999). Because of their limited resources and small size, seedlings are also the demographic stage most susceptible to herbivore damage (Fenner 1987). Relatively small amounts of tissue removal from adult *L. maackii* plants may only result in minor reductions in reproductive output or in growth rates, whereas similar amounts of tissue removal in a seedling may result in dramatic decreases in survivorship or growth (Nystrand and Granström 1997). Therefore, if herbivore selectivity occurs at the seedling stage, it may be even more important in determining population dynamics than interactions between herbivores and mature plants.

Previous tests of the enemy release hypothesis have largely focused on quantifying rates of herbivory in native and introduced habitats (Wolfe 2002; Keane and Crawley 2002). While this is an important prediction of the hypothesis, it is not the only prediction relevant to understanding a species' success. The enemy release hypothesis also depends on herbivore pressure to fall predominantly on native species within the introduced range. As herbivore damage can result in decreased competitive ability, growth rates and fecundity (Lee and Bazzaz 1980; Louda 1984; Hendrix 1988; Ang et al. 1994), preferential herbivory on native species should lead to an increase in the relative performance of an invader. A change in herbivore pressure between native and introduced habitats alone does not automatically confer advantage to an exotic invader. Decreased herbivory on an invader must be coupled with herbivory on native plant populations for differential success to occur (Keane and Crawley 2002). Selective feeding by generalist herbivores may be one other mechanism leading to the success of exotic plant species in introduced habitats.

ACKNOWLEDGEMENTS

We thank Marybeth Brey and Brent Wachholder for assistance in the field and lab; R. U. Fischer and K. A. Yurkonis for comments on an earlier version of this manuscript. This research was funded by a Research Experiences for Undergraduates grant (NSF-0139028).

REFERENCES

Ang, B. N., L. T. Kok, G. I. Holtzman, and D. D. Wolf. 1994. Canada thistle (*Cirsium arvense*) response to simulated insect defoliation and plant competition. Weed Science 42:403—410.

Baker, F. C. 1939. Fieldbook of Illinois land snails. Illinois Natural History Survey Division, Manual 2, Urbana 166p.

Blossey B. and Notzold R. 1995. Evolution of increased competitive ability in invasive non indigenous plants: a hypothesis. Journal of Ecology 83:887—889.

Buhrmester, R. A., J. E. Ebinger and D. S. Seigler. 2000. Sambunigrin and cyanogenic variability in populations of *Sambucus canadensis* L. (Caprifoliaceae). Biochemical Systematics and Ecology 28:689—695.

Callaway, R. M. and E. T. Aschehoug. 2000. Invasive plants versus their new and old neighbors: a mechanism for exotic invasion. Science 290:521—523.

Clay, K., S. Marks, and G. P. Cheplick. 1993. Effects of insect herbivory and fungal endophyte infection on competitive interactions among grasses. Ecology 74:1767—1777.

Dillenburgh, L. R., D. F. Whigham, A. H. Teramura, and I. N. Forseth. 1993. Effects of vine competition on availability of light, water, and nitrogen to a tree host (*Liquidambar styraciflua*). American Journal of Botany 80:244—252.

Fenner, M. 1987. Seedlings. New Phytologist 106:35—47.

Fenner, M., M. E. Hanley, and R. Lawrence. 1999. Comparison of seedling and adult palatability in annual and perennial plants. Functional Ecology 13:546—551.

Fogarty, G. and J. M. Facelli. 1999. Growth and competition of *Cytisus scoparius*, an invasive shrub, and Australian native shrubs. Plant Ecology 144:27—35.

Fortin, M. and Y. Mauffette. 2002. The suitability of leaves from different canopy layers for a generalist herbivore (Lepidoptera: Lasiocampidae) foraging on sugar maple. Canadian Journal of Forest Research 32:379—389.

Fritz, R. S., C. G. Hochwender, D. A. Lewkiewicz, S. Bothwell and C. M. Orians. 2001. Seedling herbivory by slugs in a willow hybrid system: developmental changes in damage, chemical defenses, and plant performance. Oecologia 129:87—97.

Gould, A. M. A. and D. L. Gorchov. 2000. Effects of the exotic invasive shrub *Lonicera maackii* on the survival and fecundity of three species of native annuals. American Midland Naturalist 144:36—50.

Hanley, M. E., M. Fenner, and P. J. Edwards. 1995a. An experimental field study of the effects of mollusc grazing on seedling recruitment and survival in grassland. Journal of Ecology 83:621—627.

Hanley, M. E., M. Fenner, and P. J. Edwards. 1995b. The effect of seedling age on the likelihood of herbivory by the slug *Deroceras reticulatum*. Functional Ecology 9:754—759.

Hanley, M. E., M. Fenner, and P. J. Edwards. 1996. The effect of mollusc grazing on seeding recruitment in artificially created grassland gaps. Oecologia 106:240—246.

Hendrix, S. D. 1988. Herbivory and its impact on plant reproduction. p. 246—263. *In:* J. Lovett-Doust (ed.). Plant Reproductive Ecology Oxford University Press, New York.

Hulme, P. E. 1996a. Herbivores and the performance of grassland plants: a comparison of arthropod, mollusc and rodent herbivory. Journal of Ecology 84:43—51.

Hulme, P. E. 1996b. Herbivory, plant regeneration, and species coexistence. Journal of Ecology 84:609—615.

Hutchinson, T. F. and J. L. Vankat. 1997. Invasibility and effects of Amur honeysuckle in southwestern Ohio forests. Conservation Biology 11:1117—1124.

Hutchinson, T. F. and J. L. Vankat. 1998. Landscape structure and spread of the exotic shrub *Lonicera maackii* (Amur honeysuckle) in southwestern Ohio forests. American Midland Naturalist 139:383—390.

Keane, R. M and M. J. Crawley. 2002. Exotic plant invasions and the enemy release hypothesis. Trends in Ecology and Evolution 17:164—170.

Lee, T. D. and F. A. Bazzaz. 1980. Effects of defoliation and competition on growth and reproduction in the annual plant *Abutilon theophrasti*. Journal of Ecology 68:813—821.

Louda, S. M. 1984. Herbivore effect on stature, fruiting, and leaf dynamics of a native crucifer. Ecology 65:1379—1386.

Louda, S. M. 1989. Differential predation pressure: a general mechanism for structuring plant communities along complex environmental gradients. Trends in Ecology and Evolution 4:158—159.

Luken, J. O. and N. Goessling. 1995. Seedling distribution and potential persistence of the exotic shrub *Lonicera maackii* in fragmented forests. American Midland Naturalist 133:124—130.

Nystrand, O. and A. Granström. 1997. Forest floor moisture controls predator activity on juvenile seedlings of *Pinus sylvestris*. Canadian Journal of Forest Research 27:1746—1752.

Peters, H. A., B. Baur, F. A. Bazzaz, and C. Körner. 2000. Consumption rates and food preferences of slugs in a calcareous grassland under current and future CO_2. Oecologia 125:72—81.

Scheidel, U. and H. Bruelheide. 1999. Selective slug grazing on montane meadow plants. Journal of Ecology 87:828—838.

Trisel, D. E. 1997. The invasive shrub, *Lonicera maackii* (Rupr.) Herder (Caprifoliaceae): factors contributing to its success and its effect on native species (*Acer saccharum, Fraxinus americana, Quercus rubra, Prunus serotina*). Ph.D. Thesis, Miami University, Oxford. 200 p.

Weiner, J. 1993. Competition, herbivory and plant size variability: *Hypochaeris radicata* grazed by snails (*Helix aspera*). Functional Ecology 7:47—53.

Wolfe, R. W. 2002. Why alien invaders succeed: support for the escape-from-enemy hypothesis. American Naturalist 160:705—711.

ERIGENIA, Number 20, October 2004, pp 8—14

GERMINATION OF *Silene regia* SEEDS FROM FOUR SITES IN LAWRENCE COUNTY, ILLINOIS, FOLLOWING SCARIFICATION OR STRATIFICATION

Nicolette L. Flocca[1], Janice M. Coons[2], Henry R. Owen[2],
Brian J. Fischer[2], and Bob E. Edgin[3]

ABSTRACT: *Silene regia* Sims is an endangered prairie forb in Illinois where small isolated colonies are scattered. In Lawrence County, two sites (Allison Prairie and Chauncey Marsh) have fewer plants (6—23) than two other sites (County Road and Cemetery) with 26—45 plants. Information on seed germination in these isolated colonies is needed. Our goal was to evaluate seed germination of *S. regia* from colonies in Lawrence County, Illinois. *S. regia* fruits were collected from these four sites on August 9 and 19, 1999. Seeds were scarified by cutting the seed coat, or they were stratified at 2 C for 12 or 15 weeks. Seeds from Chauncey Marsh weighed less than those from other sites. With the exception of seeds from Chauncey Marsh, scarification increased germination within each site. When significant germination differences occurred due to site, they were apparent on stratified seed, where frequently Allison Prairie was highest and Chauncey Marsh was lowest. Germination differences between stratified and control seeds were inconsistent, although stratified seeds had up to 67% higher germination than control seeds when significant differences occurred. These increases in seed germination were most evident in seeds collected on August 9th and stratified for 12 weeks. Seed that was neither scarified nor stratified germinated after storage, indicating that scarification and stratification are not absolute germination requirements with after-ripened seeds. Seed germination at different sites did not correspond directly with population sizes, and multiple mechanisms were present for breaking seed dormancy in *S. regia*.

INTRODUCTION

Silene regia Sims (commonly known as royal catchfly) is an endangered prairie forb found sparingly in mesic prairies and oak savannas from southeastern Kansas to northeastern Illinois (Ladd 1995). Menges (1995) cites lack of fire and decreased pollinator visitation (ruby-throated hummingbirds in particular) as reasons for the diminished success of *S. regia*. More generally, habitat fragmentation and a severe decline in prairie habitats throughout the midwestern states also have contributed to the endangered status of this species. According to Menges (1995), fire and soil disturbance have a positive effect on seed germination, since seeds require light to germinate. Menges (1991) also indicated that inbreeding due to small population sizes of *S. regia* has a negative effect on seed germination. Western populations of *S. regia* were more genetically diverse than eastern populations, based on the Shannon-Weaver Index (Dolan 1994). Unlike the western populations of this species, genetic variation of *S. regia* was correlated positively with population size in the east (Dolan 1994).

Seed dormancy is reported in seeds of *S. regia*. Seeds of *S. regia* did not after-ripen during the summer (Baskin and Baskin 1988), but seed dormancy of *S. regia* was overcome by cold stratification (Baskin and Baskin 1988; Menges 1991, Menges 1995, Baskin and Baskin 1998). Studies focused on whether or not mechanical scarification

[1]Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, Illinois 61801 (Present address: Nicholas School of the Environment and Earth Sciences, Duke University, Durham, North Carolina 27708)
[2]Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920, author for correspondence.
[3]Illinois Nature Preserves Commission, Springfield, Illinois 62701

was required for germination of *S. regia* were not found, although seeds of *Saponaria officinalis* L. (bouncingbet), also in Caryophyllaceae, responded to scarification. Lubke and Cavers (1969) found that 100% of *S. officinalis* seeds germinated when scarified by nicking the seed coat with a razor. Moreover, scarification by shaking seeds for two days with limestone gravel and water from the Thames River in Canada, where the seeds were collected, yielded significantly higher germination of *S. officinalis* than no scarification, one day of scarification, or 3 to 5 days of scarification (Lubke and Cavers 1969). *S. regia* and *S. officinalis* also share a physical resemblance in the vegetative portions of their shoots, both having an opposite leaf arrangement and lanceolate leaves with entire margins. However, their success in the midwest is radically different, with the former being endangered and the latter being an invasive species originating from Europe.

S. regia originally was reported in eleven counties of Illinois, although currently it only remains in four (Herkert and Ebinger 2002). In counties where it remains, colonies are small and fragmented. At four sites where it is still found in Lawrence County, Illinois, population sizes (number of individual plants) in 1997, 1998 and 1999, respectively, were 6, 11 and 13 for Allison Prairie; 35, 45 and 32 for County Road; 26, 30 and 38 for Cemetery; and 12, 23 and 11 for Chauncey Marsh (B. Edgin, personal observations). For Allison Prairie, multiple stems were present on each plant (Edgin et al. 2003). Allison Prairie and Chauncey Marsh plants are the remnants of 25 plants that were introduced to each site in October 1993. The transplants had been grown from seed collected from the Cemetery the previous year. Plants at the County Road and the Cemetery are naturally occurring. It is unknown whether these small population sizes have resulted in inbreeding and reduced seed germination, as reported by Menges (1991) for other populations. The goal of this study was to evaluate the seed germination of *S. regia* from isolated colonies in Lawrence County, Illinois, and to compare how scarification and stratification affect their germination.

MATERIALS AND METHODS

Silene regia Sims fruits containing seeds were collected at four sites in Lawrence County, Illinois. These sites are within 32 kilometers of each other and have been labeled as Allison Prairie, County Road, Cemetery and Chauncey Marsh. Dried fruits were selected randomly from different plants with less than 10% of available fruits on each plant being removed. *Saponaria officinalis* L. seeds also were collected from the Cemetery site for a comparison in scarification studies. Fruits for *S. regia* were collected on August 9 and August 19, 1999, whereas those for *S. officinalis* were collected only on August 19, 1999. Seeds were removed from fruits by hand. Average seed masses were determined using three replications of 50 seeds each. Until the summer of 2000, seeds were stored at room temperature; and then they were moved to a seed storage chamber (4 C, 50% relative humidity).

Scarification studies

In fall 2000, 60 seeds of *Silene regia* from each of the four sites were randomly chosen, as well as 60 seeds of *Saponaria officinalis* from the August 19, 1999, collection. Thirty of the 60 seeds were scarified using a razor blade to break the seed coat. All seeds were dusted with thiram (tetramethylthiuram disulfide, 50% active ingredient) to decrease fungal contamination that might affect germination. Seeds were segregated by species, site, and scarification treatment. Each treatment of 30 seeds was divided into groups of ten for three replications. Low seed numbers were used due to limited seed availability. Seeds were placed into a 90 x 15 mm polystyrene Petri dish containing 5 ml of distilled water and two Whatman #1 filter paper disks. Petri dishes were sealed with Parafilm to maintain moisture within the dish. Dishes were placed into three 41.2 x 28.5 x 17.5 cm clear Rubbermaid® tubs with each tub containing a separate replication. Tubs were placed into a growth chamber at 25 C. The light intensity was 268 µmol m^{-2} s^{-1} for 14 h daily. Germinated seeds and moldy seeds were counted daily for 16 days with germination defined as the time when the radicle could be seen emerging from the seed. No further tests were done on ungerminated seeds.

Stratification studies

Seeds of *Silene regia* from both collection dates were stratified by placing seeds in moist paper towels within plastic bags and storing at 2 C. Stratification began on two different dates, October 19, 1999, and November 19, 1999. After 12 and 15 weeks of stratification, seeds from each site and collection date were removed. Thus, four stratification treatments were used: started in October for 12 weeks, started in October for 15 weeks, started in November for 12 weeks, and started in November for 15 weeks. Control seeds were stored in glass jars at room temperature (23 C) during the stratification of the other seeds. Five seeds per dish were dusted with thiram and then placed into each of three 90 x 15 mm glass Petri dishes with two disks of Whatman #1 filter paper and 5 ml of distilled water. Low seed numbers were used due to limited seed availability. Petri dishes were placed into 41.2 x 28.5 x 17.5 cm clear Rubbermaid® tubs in a seed germinator at 25 C with an average light intensity of 46 µmol m^{-2} s^{-1} for 16 h daily. Germinated seeds and moldy seeds were counted daily for 16 days with germination defined as the time when the radicle could be seen emerging from the seed. No further tests were done on ungerminated seeds.

Statistical analyses

The statistics program, Costat, was used to analyze the data by analysis of variance with a randomized complete block design, followed by mean separations using Duncan's multiple range test at the 5% level. Means and standard deviations also were calculated.

RESULTS

Seed characteristics

Table 1 shows the average masses of 50 *Silene regia* seeds harvested on August 9 and August 19, 1999. Seeds collected at Allison Prairie and County Road on August 9 were significantly heavier than those collected at the Cemetery and Chauncey Marsh on the same date. Seeds collected on August 19 from the County Road were significantly heavier than those from any other collection site. By comparison, the average mass of 50 *Saponaria officinalis* seeds was 77 ± 4 mg.

Seed coats of *Silene regia* seeds collected from all sites on August 9 were tan and dark brown, excluding those seeds from the Cemetery site, which were only tan. Seeds collected from Allison Prairie on August 19 were tan and maroon, while those collected from the Cemetery were gray and dark brown. The rest of the seeds collected on August 19 were tan and dark brown. Thus, differences in seed color were present.

Scarification

Table 2 shows scarification effects. A significant scarification effect for *Silene regia* was noted, with higher germination in scarified seeds than non-scarified seeds within each site, excluding Chauncey Marsh. *Saponaria officinalis* also demonstrated a significant scarification effect with 100% germination when scarified and no germination when not scarified. All of the scarified *S. regia* seed had less germination than that of the *S. officinalis*. Also, non-scarified *S. officinalis* seeds had the lowest germination of all the treatments (0%).

Table 1. Masses (mg) of 50 *Silene regia* seeds from four sites in Lawrence County, Illinois, on two harvest dates.

Site	August 9, 1999	August 19, 1999
Allison Prairie	41 ± 2 a[1]	36 ± 7 bc
County Road	46 ± 2 a	60 ± 5 a
Cemetery	34 ± 4 b	45 ± 3 b
Chauncey Marsh	31 ± 3 b	34 ± 6 c

[1] Mean ± standard deviation. Means followed by different letters within a column are significantly different (Duncan's multiple range test, 5% level).

Table 2. Scarification effects on germination percentages of *Silene regia* and *Saponaria officinalis* seeds collected from different sites in Lawrence County, Illinois.

	S. regia		*S. officinalis*	
Site	scarified	non-scarified	scarified	non-scarified
Allison Prairie	80 ± 20 ab[1,2]	23 ± 15 b		
County Road	83 ± 15 a	23 ± 25 b		
Cemetery	80 ± 17 ab	70 ± 17 a		
Chauncey Marsh	50 ± 10 b	30 ± 10 b	100 ± 0	0 ± 0

[1] Mean ± standard deviation. Means followed by different letters within a column are significantly different (Duncan's multiple range test, 5% level).

[2] All means within a site (scarified vs. non-scarified) were significantly different with the exception of the Chauncey Marsh site for *S. regia*.

Table 3. Germination percentages for *Silene regia* seeds collected from four sites on two harvest dates when stratified for 12 weeks.

	Stratification began 10/19/99		Control	
Site	Aug 9	Aug 19	Aug 9	Aug 19
Allison Prairie	100 ± 0 a [1,2]	60 ± 35 a	33 ± 23 a	13 ± 23 a
County Road	93 ± 12 a	53 ± 12 a	47 ± 31 a	33 ± 31 a
Cemetery	53 ± 31 b	87 ± 23 a	27 ± 31 a	47 ± 12 a
Chauncey Marsh	27 ± 23 b	47 ± 31 a	7 ± 12 a	40 ± 35 a

	Stratification began 11/19/99		Control	
Site	Aug 9	Aug 19	Aug 9	Aug 19
Allison Prairie	87 ± 12 a [3]	73 ± 23 a [4]	67 ± 12 a	20 ± 20 a
County Road	73 ± 23 a	40 ± 20 b	73 ± 23 a	47 ± 12 a
Cemetery	47 ± 12 a	73 ± 12 a	33 ± 12 a	53 ± 23 a
Chauncey Marsh	53 ± 31 a	47 ± 12 ab	60 ± 35 a	40 ± 20 a

[1] Mean ± standard deviation. Means for October initiation followed by different letters within a column are significantly different (Duncan's multiple range test, 5% level).

[2] Means for October initiation of stratified seeds were significantly higher than control seeds within a collection date and stratification date based upon two-way analysis of variance at 5% level.

[3] For seed collected on August 9, means for November initiation of stratified seed were significantly higher than control seeds at all sites, excluding County Road, based upon one-way analysis of variance at 5% level, which was conducted due to a significant interaction between site and stratification treatment.

[4] For seed collected on August 19, means for November initiation of stratified seed were not significantly different than for control seeds based upon two-way analysis of variance at 5% level.

Table 4. Germination percentages for *Silene regia* seeds collected from four sites on two harvest dates when stratified for 15 weeks.

	Stratification began 10/19/99		Control	
Site	Aug 9	Aug 19	Aug 9	Aug 19
Allison Prairie	100 ± 0 a [1,2]	60 ± 20 a [3]	53 ± 42 a	7 ± 12 a
County Road	67 ± 23 b	60 ± 0 a	67 ± 12 a	40 ± 20 a
Cemetery	73 ± 12 b	73 ± 12 a	13 ± 23 a	40 ± 20 a
Chauncey Marsh	7 ± 12 c	33 ± 23 a	13 ± 12 a	13 ± 12 a

	Stratification began 11/19/99		Control	
Site	Aug 9	Aug 19	Aug 9	Aug 19
Allison Prairie	93 ± 12 a [4]	53 ± 23 a [5]	47 ± 12 b	33 ± 12 a
County Road	60 ± 0 b	47 ± 12 a	87 ± 23 a	33 ± 12 a
Cemetery	60 ± 0 b	33 ± 12 ab	40 ± 0 b	67 ± 31 a
Chauncey Marsh	20 ± 20 c	20 ± 0 b	60 ± 0 b	27 ± 12 a

[1] Mean ± standard deviation. Means for October initiation followed by different letters within a column are significantly different (Duncan's multiple range test, 5% level).

[2] For seed collected on August 9, means for October initiation of stratified seed were significantly higher than control seeds only at the Cemetery site, based upon one-way analysis of variance at 5% level, which was conducted due to a significant interaction between site and stratification treatment.

[3] For seed collected on August 19, means for October initiation of stratified seed were significantly higher than for control seeds based upon two-way analysis of variance at 5% level.

[4] For seed collected on August 9, means for November initiation of stratified seed were not significantly different than control seeds based upon two-way analysis of variance at 5% level.

[5] For seed collected on August 19, means for November initiation of stratified seed were significantly higher than control seeds, based upon two-way analysis of variance at 5% level.

Table 2 reveals a significant site effect for scarified seeds of *S. regia*, in that Chauncey Marsh seeds had lower percent germination than seeds from the County Road site. A significant location effect also was revealed in the non-scarified seeds where germination of seeds for the Cemetery site was higher than all other sites.

Stratification

Tables 3 and 4 demonstrate that *Silene regia* seeds collected on August 9 and August 19 had variable final germination percentages following stratification for twelve weeks or fifteen weeks with different stratification start dates. Some sites yielded higher percent germination within a stratification treatment, yet few consistent patterns occurred across sites, except for frequently lower germination of seeds from Chauncey Marsh as well as higher germination of seeds from Allison Prairie within many stratification treatments. These site differences were more notable in stratified than control seeds. Differences between control and stratified seed germination within a site also were inconsistent; however, when they were different, stratified seed had a higher germination than control seed. Moreover, no apparent differences were observed in germination of *S. regia* seed related to stratification start date or duration.

DISCUSSION

Silene regia seeds showed dormancy that was partially broken by several factors, including scarification, stratification and after-ripening, although 100% germination rarely was achieved. None of these factors were an absolute requirement for germination. Rather, each of these techniques enhanced germination to varying degrees. These findings do not agree with literature on seed germination of *S. regia* in nature (Baskin and Baskin 1988, Menges 1991, Menges 1995, Baskin and Baskin 1998) that suggest stratification is required to break dormancy. Previous reports do not address the influence of scarification on these seeds. In the present study, germination occurred for seeds that were scarified, but were not stratified. In addition, in the present study, control seeds germinated when after-ripened even without stratification, unlike previous studies (Baskin and Baskin 1988). When the seed initially was collected, twenty seeds were used in a trial germination study in early fall 1999. None of the seeds germinated within two weeks. Further investigation is needed to document this effect more completely, since the present study was not designed to test after-ripening. These results suggest that the growth potential of freshly matured seed is insufficient to germinate without additional maturation, or elimination of the mechanical restriction of the seed coat. Since these various techniques all enhanced germination, the dormancy of these seeds may be related to both mechanical (seed coat) and physiological (embryo) factors.

Dormancy in seed of *S. regia* was more complex than for seed of *S. officinalis*, as dormancy of *S. officinalis* was broken completely by scarification, suggesting dormancy is controlled primarily by the seed coat. These results are consistent with the preliminary germination tests of Lubke and Cavers (1969), who found that scarification of *S. officinalis* by nicking the seed coat yielded 100% germination. For *S. regia*, both seed coat and embryo factors likely were involved, whereas for *S. officinalis*, only seed coat factors likely were involved. However, other seed factors such as seed set, distribution, longevity, and herbivory (Menges 1995, Edgin et al. 2003) also may influence the success of these two species.

Factors other than dormancy also may be affecting the germination of *Silene regia* seeds. One factor may be the location where the plants were grown. Although considerable variation occurred, germination usually was lowest for seed from Chauncey Marsh and highest for seed from Allison Prairie as compared to County Road and Cemetery. Both Chauncey Marsh and Allison Prairie had smaller population sizes in comparison to County Road and Cemetery, so seed germination was not related to population size. Seed from Chauncey Marsh had the lowest seed masses, suggesting a correlation with germination percentage and seed mass. Plants at Allison Prairie are in a gravel prairie restoration dominated by sparse clump-forming grasses. Cemetery and County Road plants are along roadsides. These three sites all receive strong direct sunlight throughout the day and have relatively little competition. Plants at Chauncey Marsh are in a dense stand of big blue stem (*Andropogon gerardii*) which may increase shading, reduce nutrient availability, and inhibit successful location of the plants by pollinators.

Another factor is the date that the seeds were collected. Germination of *Silene regia* seed showed no consistent pattern relative to these dates; i.e., seed from one date did not always have higher germination than seed from another date. However, significant differences between dates were observed. Seed color also varied on different collection dates and sites. Seeds collected on different dates may represent different maturities, and seed maturity affects germination (Baskin and Baskin 1998).

ACKNOWLEDGMENTS

Council on Faculty Research, Eastern Illinois University; Illinois Wildlife Preservation Fund, Illinois Department of Natural Resources; and Undergraduate Research Council, Eastern Illinois University.

LITERATURE CITED

Baskin, C. C. and J. M. Baskin. 1988. Germination ecophysiology of herbaceous plant species in a temperate region. *Am. J. Bot.*, 75:286—305.

Baskin, C. C. and J. M. Baskin. 1998. Seeds: ecology, biogeography, and evolution of dormancy and germination. Academic Press, San Diego, California. 666 p.

Dolan, R. W. 1994. Patterns of isozyme variation in relation to population size, isolation, and phytogeographic history in royal catchfly (*Silene regia*; Caryophyllaceae). *Am. J. Bot.*, 81:965—972.

Edgin, B., B. Garrard, G. C. Tucker, and J. E. Ebinger. 2003. Vegetation of Allison Prairie—A gravel prairie reconstruction in Lawrence County, Illinois. *Erigenia*,19:52—59.

Herkert, J. R. and J. E. Ebinger (editors). 2002. Endangered and threatened species of Illinois: Status and distribution, Volume 1 – Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 p.

Ladd, D. 1995. Tallgrass prairie wildflowers: a field guide. Falcon Publishing, Inc., Helena, Montana. 262 p.

Lubke, M. and P. Cavers. 1969. The germination ecology of *Saponaria officinalis* from riverside gravel banks. *Can. J. Bot.*, 47:529—535.

Menges, E. S. 1991. Seed germination percentage increases with population size in a fragmented prairie species. *Conserv. Biol.*, 5 (2):158—164.

Menges, E. S. 1995. Factors limiting fecundity and germination in small populations of *Silene regia* (Caryophyllaceae), a rare hummingbird-pollinated prairie forb. *Am. Midl. Nat.*, 133:242—55.

Erigenia, Number 20, October 2004, pp. 15—21

Ground Layer Vegetation of Pin Oak / Swamp White Oak Flatwoods in Illinois

William E. McClain[1], Bob Edgin[2] and John E. Ebinger[3]

Abstract: Flatwoods with an overstory dominated by *Quercus palustris* Muenchh. (pin oak) and *Q. bicolor* Willd. (swamp white oak) are rare in Illinois. Usually occurring as small inclusions within post oak flatwoods, these wet-mesic forests are small, usually less than a few ha in size and are commonly flooded for extended periods of time in winter, spring, and early summer. *Carex squarrosa* L. and *C. tribuloides* Wahlenb. dominate the ground layer in these forests along with numerous other Cyperaceae. The woody vine *Toxicodendron radicans* (L.) Kuntze (poison ivy) is usually plentiful, while *Cinna arundinacea* L. (stout wood reed) is a prominent summer component. A total of 139 plant species, representing 48 families, were encountered in these flatwoods.

Introduction

Flatwood forests dominated by *Quercus stellata* Wangh. (post oak) are common throughout much of the midwest (Braun 1950). This community, referred to as Southern Flatwoods (White and Madany 1978), is especially abundant in the southern half of Illinois and has been studied extensively (Braun 1950, Fralish 1988, Coates et al. 1992, Taft et al. 1995). Occasionally associated with these flatwoods are extremely wet sites where *Q. palustris* Muenchh. (pin oak) and *Q. bicolor* Willd. (swamp white oak) dominate the overstory. A dense soil or claypan at or near the surface in combination with the flat topography allows for the impoundment of water for extended periods of time during the growing season. This cover type is usually called the "*Quercus palustris-(Quercus bicolor)* Seasonally Flooded Forest Alliance" (Drake and Faber-Langendoen 1997), and shows similarities to the SAF type 65, Pin Oak-Sweet Gum forest (Eyre 1980). These closed canopy forests have an open understory characterized by few woody individuals, and a ground layer dominated by species of the Cyperaceae, with a few forbs and woody vines also being important components. The present study was undertaken to determine the structure and composition of ground layer vegetation in three pin oak/swamp white oak flatwoods in central and southern Illinois.

Methods

The flatwoods were visited throughout the growing seasons of 1998 to 2001. Voucher specimens were collected, identified, and deposited in the Stover-Ebinger Herbarium of Eastern Illinois University, Charleston, Illinois (EIU). Criteria for designating native and non-native taxa followed Fernald (1950), Mohlenbrock (1986), and Gleason and Cronquist (1991). All vascular plant species are listed in Appendix 1 along with the author's (JEE) collecting number.

Ground layer vegetation was analyzed in late July of 2001 using m^2 plots located at one meter intervals along four 25 m transects placed near the center line of each woods (n = 25/transect). Odd-numbered quadrats were located on the right side of the transect line, even-numbered quadrats were located on the left side. A random numbers table (single digit) was used to determine the number of meters the quadrat was located from the transect line. Cover of each species was determined by using the Daubenmire cover class system (Daubenmire 1959) as modified by Bailey and Poulton (1968). Only plants rooted within the frame of the quadrat were recorded. Frequency (%), relative frequency, cover, relative cover, and importance value (IV) for each species were determined. As used here, the IV is the sum of the relative frequency and relative cover. Nomenclature follows Mohlenbrock (1986).

[1] Adjunct Research Associate in Botany, Illinois State Museum, Springfield, Illinois 62706
[2] Illinois Nature Preserves Commission, 1 Natural Resources Way, Springfield, Illinois 62702
[3] Center for Biodiversity, Illinois Natural History Survey, Champaign, Illinois 61820, author for correspondence

DESCRIPTION OF THE STUDY AREAS

The forests studied are located in the Effingham Plain Section of the Southern Till Plain Natural Division of Illinois (Schwegman 1973). These sites appeared to be relatively undisturbed and had no signs of recent timber harvest, although unsuccessful attempts had been made to drain the sites. The overstories of all sites were studied within the last few years (Tecic et al. 2001, Edgin et al. 2003). Pin oak dominated all sites, accounting for more than 50% of the IV, while swamp white oak accounted for at least 25% of the remaining IV. A few individuals of post oak, *Diospyros virginiana* L. (persimmon), *Ulmus americana* L. (American elm), *Carya ovata* (Mill.) K. Koch (shagbark hickory), and *Fraxinus pennsylvanica* Marsh. (green ash) were occasionally present. In these forests, woody seedling density varied from 1,000 to 6,880 stems/ha, while saplings ranged from 346 to 1,164 stems/ha, indicating a very open understory.

The three woods studied ranged from 2 to 4 ha in size, and were located on areas of extremely level topography. The soils were impervious silty clay loams to silt loams that had a claypan at or near the surface (Bramstedt et al. 1992). The soils were seasonally wet with pooled water during winter, spring, and early summer, but were relatively dry in late summer and fall. The surface and subsoil layers were acidic with the pH ranging from 3.5—5.0.

Venedy Flatwoods

Located near Mud Lake Road, this flatwoods is on the broad floodplain of the Kaskaskia River about 2.5 km north of Venedy, Washington County, Illinois (NE1/4 S22 T1S R5W). The overstory was examined by Tecic et al.(2001), and is surrounded by a post oak flatwoods community on three sides, with an open field to the west.

Eversgerd Flatwoods

This site, located on a broad terrace of Shoal Creek, about 4 km northeast of its confluence with the Kaskaskia River, and about 5 km south of Germantown, Clinton County, Illinois (NW1/4 S28 T1N R4W). Surrounded on all sides by a good quality post oak flatwoods, the overstory of both the post oak/swamp white oak and the pin oak communities were examined in detail by Edgin et al. (2003).

Island Grove Flatwoods

This flatwoods is located in the headwater region between Dietrick and Island creeks, 5 km NW of Wheeler, Jasper County, Illinois (SE1/4S 3 T8N R8E). Surrounded on the north and west by mesic forest and cultivated fields on the south and east, the overstory of this forest was examined by Tecic et al. (2001).

RESULTS AND DISCUSSION

The flora of these pin oak/swamp white oak communities consisted of 139 taxa, representing 93 genera and 48 families (Appendix I). Pteridophyta were poorly represented, accounting for only one species. Of the remaining taxa, 39 were monocots in seven families, and 99 were dicots in 40 families. Exotic species accounted for eight taxa, and 26 woody species were identified. The state endangered *Hypericum adpressum* Bart. (shore St. John's-wort) was found in the Venedy flatwoods in Washington County (Herkert and Ebinger 2002).

Members of the Cyperaceae dominated the ground layer, with *Carex squarrosa* L., *C. tribuloides* Wahlenb., and *Scirpus georgianus* Harper being among the top five herbaceous species on most sites (Table 1). These three species were extremely common, in many areas being the only species present, as indicated by their high relative covers and importance values. Though 13 *Carex* species were found in the study sites, most were not common, being restricted to a few small clumps on one or two sites, or were found near forest boundaries.

The only grass common to all three sites was *Cinna arundinacea* L. (stout wood reed), though *Leersia virginica* Willd. (white grass) and *Agrostis perennans* (Walt.) Tuckerm. (upland bent grass) were sometimes found in plots along with the non-native *Poa pratensis* L. (Kentucky bluegrass). Forbs were not particularly important; *Galium obtusum* Bigel. (wild madder) was the only forb present in plots at all three sites. Many other forbs were present, but were restricted to localized areas and usually occurred in low numbers.

Overall, woody vines were an important component of the ground layer with poison ivy and *Parthenocissus quinquefolia* (L.) Planch. (Virginia creeper) among the top five species at two sites. Tree seedlings were abundant, with pin oak and swamp white oak being fairly common along with occasional seedlings of persimmon, green ash, and American elm.

Of the 139 taxa recorded in the study sites, only 31 (22%) were present in the plots (Table 1). Most species were associated with the forest margins, or found in disturbed sites. Most were rare, and in a few instances, only one or a few individuals, were encountered. Also, at the forest edges, some species more commonly associated with post oak forests were found, with only incidental occurrences in the pin oak/swamp white oak forests. Of eight exotic species encountered, only Kentucky bluegrass was found in plots, the remaining usually occurred as scattered individuals, or associated with areas of disturbance or along forest margins.

Of the three flatwoods examined, Island Grove was the largest at 4 ha in size, and had the highest species diversity. This diversity was probably due to its proximity to open

fields and a high number of canopy openings. Dead-standing trees at Island Grove averaged 52 stems/ha, compared to less than 20 stems/ha at the other sites (Tecic et al. 2001). The open canopy created favorable conditions for higher species diversity and cover in the ground layer, with bare ground having an average cover of 57% at Island Grove. In contrast, bare ground averaged 85—88% at the other two sites.

ACKNOWLEDGMENTS

The authors would like to thank Gordon Tucker, Eastern Illinois University, and Tony Reznicek, University of Michigan, for help in identifying species of Cyperaceae, and Terry Esker, Illinois Department of Natural Resources, for help in the studies at the Island Grove site.

LITERATURE CITED

Bailey, A. W. and C. E. Poulton. 1968. Plant communities and environmental relationships in a portion of the Tillamook burn, northwestern Oregon. Ecology 49:1—13.

Bramstedt, M. W., W. R. Kreznor, B. C. Fitch, R. T. Risley and B. S. Simcox. 1992. Soil survey of Jasper County. United States Department of Agriculture, Soil Conservation Service, and Illinois Agricultural Experiment Station. U. S. Government Printing Office, Washington, D.C. 157 pp + maps.

Braun, E. L. 1950. Deciduous forests of eastern North America. Hafner Publishing Company, New York. xiv + 596 pp.

Coates, D. T., K. L. Lyman and J. E. Ebinger. 1992. Woody vegetation structure of a post oak flatwoods in Illinois. Castanea 57:196—201.

Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43—64.

Drake, J. and D. Faber-Langendoen. 1997. An alliance level classification of the vegetation of the midwestern United States. The Nature Conservancy, Minneapolis, Minnesota. 397 pp.

Edgin, B., W. E. McClain, B. Gillespie and J. E. Ebinger. 2003. Vegetation composition and structure of Eversgerd post oak flatwoods, Clinton County, Illinois. Northeastern Naturalist 10:111—118.

Eyre, F. H. 1980. (editor). Forest cover types of the United States and Canada. Society of American Foresters, Washington, D.C. 148 pp + maps.

Fernald, M. L. 1950. Gray's Manual of Botany. 8th ed. American Book Company, New York. lxiv + 1632 pp.

Fralish, J. S. 1988. Diameter-height biomass relationships for *Quercus* and *Carya* in Posen Woods Nature Preserve. Transactions of the Illinois State Academy of Science 81:31—38.

Gleason, H. A. and A. Cronquist. 1991. Manual of the Vascular Flora of Northeastern United States and Adjacent Canada. 2nd ed. The New York Botanical Garden, Bronx. lxxv + 910 pp.

Herkert, J. R. and J. E. Ebinger 2002. (editors) Endangered and threatened species of Illinois: status and distribution, Volume 1 - Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 pp.

Mohlenbrock, R. H. 1986. Guide to the Vascular Flora of Illinois, revised and enlarged edition, Southern Illinois University Press, Carbondale, Illinois. vii + 507 pp.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois Nature Preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois. 32 pp + map.

Taft, J. B., M. W. Schwartz and R. L. Phillippe. 1995. Vegetation ecology of flatwoods on the Illinois till plain. Journal of Vegetation Science 6:647—666.

Tecic, D., W. E. McClain, D. E. Greuel and J. E. Ebinger. 2001. Structure and composition of pin oak/swamp white oak flatwood forests in Illinois. Transactions of the Illinois State Academy of Science 94:19—26.

White, J. and M. N. Madany. 1978. Classification of natural communities in Illinois. Pages 309—405. *In* J. White (editor). Illinois Natural Areas Inventory, Technical Report. Illinois Natural Areas Inventory, Urbana, Illinois. xix + 426 pp.

Table 1. Relative frequency, relative cover, and importance values of ground layer species in three pin oak/swamp white oak flatwoods in central and southern Illinois. Only species with an I.V. greater than 1 are included.

	Venedy			Eversgerd			Island Grove		
	Rel. Freq.	Rel. Cover	I.V.	Rel. Freq.	Rel. Cover	I.V.	Rel. Freq.	Rel. Cover	I.V.
Carex squarrosa	42.6	76.0	118.6	16.5	62.5	79.0	7.7	4.8	12.5
Carex tribuloides	21.6	4.5	26.1	21.6	5.7	27.3	17.3	21.0	38.3
Galium obtusum	8.8	1.5	10.3	10.2	1.5	11.7	0.3	0.0	0.3
Toxicodendron radicans	2.9	6.4	9.3	2.3	1.2	3.5	10.4	16.0	26.4
Cinna arundinacea	6.8	1.6	8.4	13.6	2.5	16.1	1.1	0.1	1.2
Parthenocissus quinquefolia	6.4	1.8	8.2	8.5	7.6	16.1	--	--	--
Scirpus georgianus	3.4	1.8	5.2	1.7	3.6	5.3	19.6	38.8	58.4
Impatiens capensis	2.0	0.9	2.9	--	--	--	14.7	5.4	20.1
Campsis radicans	0.5	2.0	2.5	--	--	--	--	--	--
Quercus bicolor	0.5	2.0	2.5	1.1	2.7	3.8	0.8	0.3	1.1
Poa pratensis	1.0	0.4	1.4	2.3	0.8	3.1	--	--	--
Aster lateriflorus	1.0	0.4	1.4	--	--	--	--	--	--
Quercus palustris	1.0	0.1	1.1	--	--	--	13.6	5.7	19.3
Diospyros virginiana	--	--	--	3.4	3.9	7.3	--	--	--
Leersia virginica	--	--	--	4.5	2.0	6.5	--	--	--
Eleocharis verrucosa	--	--	--	5.1	0.8	5.9	--	--	--
Aster vimineus	--	--	--	4.0	1.0	5.0	--	--	--
Polygonum punctatum	--	--	--	0.6	2.6	3.2	0.8	0.1	0.9
Rubus flagellaris	--	--	--	1.1	0.6	1.7	--	--	--
Boehmeria cylindrica	--	--	--	1.1	0.2	1.3	0.8	0.1	0.9
Bidens vulgata	--	--	--	0.6	0.5	1.1	--	--	--
Ranunculus septentrionalis	--	--	--	--	--	--	6.7	3.8	10.5
Scutellaria lateriflora	--	--	--	--	--	--	4.8	3.3	8.1
Others	1.5	0.6	2.1	1.8	0.3	2.1	1.4	0.6	2.0
Totals	100.0	100.0	200.0	100.0	100.0	200.0	100.0	100.0	200.0

APPENDIX I. The vascular species collected in pin oak/swamp white oak flatwoods listed alphabetically in major taxonomic groups. An asterisk indicates non-native species (*). Although most species were collected more than once, only one collecting number (JEE) is listed for each.

FERN AND FERN-ALLIES
Isoetaceae
Isoetes melanopoda Gay & Dur. 27604

DICOTS
ANACARDIACEAE
Toxicodendron radicans (L.) Kuntze 27575

APIACEAE
Cicuta maculata L. 27953
Cryptotaenia canadensis (L.) DC. 27938
Sanicula canadensis L. 30220

APOCYNACEAE
Apocynum cannabinum L. 27973

AQUIFOLIACEAE
Ilex decidua Walt. 27569

ASCLEPADACEAE
Asclepias incarnata L. 30226

ASTERACEAE
Aster lateriflorus (L.) Britt. 28176
Aster ontarionis Wieg. 28175
Aster pilosus Willd. 30446
Aster vimineus Lam. 29262
Bidens aristosa (Michx.) Britt. 30280
Bidens discoidea (T. & G.) Britt. 30275
Bidens frondosa L. 30449
Bidens vulgata Greene 30142
Boltonia asteroides (L.) L'Hér. 28177
Erechtites hieracifolia (L.) Raf. 30287
Eupatorium perfoliatum L. 30279
Eupatorium rugosum Houtt. 30447
Eupatorium serotinum Michx. 30227
Euthamia graminifolia (L.) Salisb. 30145
Helianthus divaricatus L. 30156
Helianthus mollis Lam. 30151
Lactuca floridana (L.) Gaertn. 30221
Liatris pycnostachya Michx. 30149
Parthenium integrifolium L. 30144
Rudbeckia subtomentosa Pursh 30289
Senecio glabellus Poir. 28316
Solidago canadensis L. 30425
Solidago missouriensis Nutt. 30148
Solidago nemoralis Ait. 30281
Vernonia gigantea (Walt.) Trel. 28167

BALSAMINACEAE
Impatiens capensis Meerb. 27578

BERBERIDACEAE
Podophyllum peltatum L. 27573

BIGNONIACEAE
Campsis radicans (L.) Seem. 27565

BRASSICACEAE
Cardamine bulbosa (Schreb.) BSP. 28276

CALLITRICHACEAE
Callitriche heterophylla Pursh 29515
Callitriche terrestris Raf. 27591

CAMPANULACEAE
Lobelia cardinalis L. 30228
Lobelia inflata L. 30147

CAPRIFOLIACEAE
**Lonicera japonica* Thunb. 30153
Symphoricarpos orbiculatus Moench. 27564
Viburnum prunifolium L. 27941
Viburnum recognitum Fern. 27948

CARYOPHYLLACEAE
Paronychia fastigiata (Raf.) Fern. 30285

CORNACEAE
Cornus racemosa Lam. 27952

EBENACEAE
Diospyros virginiana L. 27586

EUPHORBIACEAE
Acalypha rhomboidea Raf. 30450
Acalypha virginica L. 30283

FABACEAE
Amorpha fruticosa L. 30152

FAGACEAE
Quercus bicolor Willd. 27581
Quercus palustris Muenchh. 27951

HYPERICACEAE
Hypericum adpressum Bart. 30150
Hypericum punctatum Lam. 27970

JUGLANDACEAE
Carya ovata (Mill.) K. Koch 27577
Carya texana Buckl. 27571
Carya tomentosa (Poir.) Nutt. 27572

LAMIACEAE
Hedeoma pulegioides (L.) Pers. 30282
Lycopus virginicus L. 28170
Pycnanthemum tenuifolium Schrad. 27579
Scutellaria lateriflora L. 28172
Teucrium canadense L. 30229

LAURACEAE
Sassafras albidum (Nutt.) Nees 27576

OLEACEAE
Fraxinus pennsylvanica Marsh. 27585

ONAGRACEAE
Circaea lutetiana Aschers. & Magnus 27960
Ludwigia alternifolia L. 27967
Oenothera pilosella Raf. 27561

OXALIDACEAE
Oxalis stricta L. 27593

PHYTOLACCACEAE
Phytolacca americana L. 27592

POLEMONIACEAE
Phlox glaberrima L. 30146

POLYGALACEAE
Polygala sanguinea L. 27969

POLYGONACEAE
**Polygonum persicaria* L. 30309
Polygonum punctatum Ell. 30223
Polygonum virginianum L. 28168
**Rumex acetosella* L. 27580
Rumex verticillatus L. 27556

PRIMULACEAE
Lysimachia lanceolata Walt. 27563

RANUNCULACEAE
Ranunculus ambigens Wats. 29514
Ranunculus septentrionalis Poir. 28317

ROSACEAE
Geum canadense Jacq. 27950
Potentilla simplex Michx. 29513
Prunus serotina Ehrh. 27574
**Rosa multiflora* Thunb. 27583
Rosa setigera Michx. 27602
Rubus flagellaris Willd. 27589
Rubus pensylvanicus Poir. 27588

RUBIACEAE
Cephalanthus occidentalis L. 29802
Galium aparine L. 28315
Galium obtusum Bigel. 27587

SAXIFRAGACEAE
Penthorum sedoides L. 28171

SCROPHULARIACEAE
Gratiola neglecta Torr. 27597
Mimulus alatus Ait. 28165
Penstemon digitalis Nutt. 27582

ULMACEAE
Celtis occidentalis Willd. 27590
Ulmus americana L. 27600

URTICACEAE
Boehmeria cylindrica (L.) Sw. 27954
Pilea pumila (L.) Gray 28166

VIOLACEAE
Viola pratincola Greene 28275

VITACEAE
Parthenocissus quinquefolia (L.) Planch. 27584

MONOCOTS

ALISMACEAE
Alisma plantago-aquatica L. 29086

CYPERACACEAE
Carex annectens Bickn. 27945
Carex brevior (Dewey) Mack. 27566
Carex bushii Mack. 27972
Carex caroliniana Schwein. 27606
Carex cristatella Britt. & Brown 27605
Carex lanuginosa Michx. 29803
Carex lupulina Willd. 27562
Carex meadii Dewey 29552
Carex muskingumensis Schwein. 29805
Carex squarrosa L. 27601
Carex tribuloides Wahlenb. 30222
Carex vulpinoidea Michx. 27963
Eleocharis verrucosa (Svens.) Harms 27557
Eleocharis wolfii Gray 30154
Scirpus cyperinus (L.) Kunth 30451
Scirpus georgianus Harper 27599

IRIDACEAE
Iris shrevei Small 27937

JUNCACEAE
Juncus acuminatus Michx. 27603
Juncus brachycarpus Engelm. 27964
Juncus interior Wieg. 27568
Juncus marginatus Rostk. 27965
Juncus tenuis Willd. 27966

LILIACEAE
**Allium vineale* L. 27968

ORCHIDACEAE
Platanthera peramoema (Gray) Gray 30224

POACEAE
Agrostis perennans (Walt.) Tuckerm. 30284
Andropogon gerardii Vitman 30292
**Bromus racemosus* L. 27595
Calamagrostis canadensis (Michx.) Beauv. 30225
Cinna arundinacea L. 27559
Dichanthelium acuminatum (Sw.) Gould & Clark 27609
Elymus virginicus L. 27946
Festuca paradoxa Desv. 27961
Glyceria striata (Lam.) Hitchcock 27558
Leersia lenticularis Michx. 28173
Leersia virginica Willd. 28174
**Poa compressa* L. 27594
**Poa pratensis* L. 27607

Erigenia, Number 20, October 2004, pp. 22—28

Vegetation and Soils of the Oliver's Grove Region, Livingston County, Illinois

Mary A. Cooprider[1], Richard L. Larimore[1], John E. Ebinger[1,2], William E. McClain[3] and Vernon L. LaGesse[4]

Abstract: During the growing seasons of 1999 and 2000, soils were examined and woody vegetation surveyed in Oliver's Grove, just south of Chatsworth, Illinois. The topography of the region is a result of glacial activity that occurred around 17,000 years ago during the late Wisconsin glaciation. Glacial plains, moraines, and a large erosional channel characterize the landscape. *Quercus macrocarpa* Michx. (bur oak) probably dominated Oliver's Grove at the time of European settlement. Three remnants of this grove were examined during the present study. One woodlot was almost exclusively bur oak, another was dominated by bur oak with *Carya ovata* (Mill.) K. Koch (shagbark hickory) fairly common, while the third, found in a lowland area protected from past prairie fires, was dominated by *Tilia americana* L. (basswood) and *Celtis occidentalis* L. (hackberry). We compared General Land Office survey maps and past aerial photographs, and observed that much of the original forest and savanna were greatly decreased in size by the late 1900s, mostly due to land-use practices. In general, soils were not useful in determining the extent of this grove.

Introduction

Two types of groves historically occurred in the Grand Prairie Division of Illinois: (1) stream-side groves associated with well-developed water courses, and (2) isolated prairie groves on morainal ridges that were somewhat protected from fires by sloughs and ponds. The stream-side groves were usually extensive, extending for many kilometers along streams and rivers, occasionally broken where topography and increased fire frequency allowed fires to cross the waterways (Gleason 1913). These groves supported a great diversity of tree species (many being thin-barked and fire-sensitive) such as *Ulmus americana* L. (American elm), *Juglans nigra* L. (black walnut), *Tilia americana* L. (basswood), *Aesculus glabra* L. (Ohio buckeye), and *Celtis occidentalis* L. (hackberry) (Bogess and Bailey 1964, Boggess and Geis 1966, Schwegman et al. 1973). Fires fanned by the prevailing westerly winds commonly impacted the fire-sensitive trees located along the western margins of these large groves (Gleason 1913).

In contrast, the isolated prairie groves on morainal ridges were smaller, rarely exceeding a few square kilometers in size, with little tree diversity, being dominated by *Quercus macrocarpa* Michx (bur oak) and a few other fire resistant species (Gleason 1913, LaGesse et al. 1998, McClain et al. 1998). These groves occurred occasionally through the Grand Prairie Division of Illinois at the time of European settlement (Schwegman et al. 1973), but were particularly common in southern Ford and Livingston counties where a few remnants of these groves still exist. Most have been lost, however, and the remnants have been greatly modified by grazing, timber harvest, and fire suppression (LaGesse et al. 1998, McClain et al. 1998).

Oliver's Grove, located in the southeastern corner of Livingston County, Illinois, was about 2.4 km across and originally had a high diversity of woody species (Figure 1). Associated with morainal ridges and sloughs, this grove has characteristics of both an isolated prairie grove and a stream-side grove. During this study, the soils and the remnant forest communities of Oliver's Grove were examined to better understand the relationship between soil and vegetation in this grove.

Materials and Methods

Within Oliver's Grove, three forest remnants were selected as study sites. In 1999, a one ha study site (50 x 200 m) was located in the Turtle Pond Woodlot, while 0.5 ha study sites (50 x 100 m) were established in Gerth's Farm and Oliver's Grove Farm woodlots in 2000. Each study site was divided into quadrats 25 m on a side for ease

[1] Illinois Natural History Survey, 607 East Peabody Drive, Champaign, Illinois 61820
[2] Author for correspondence
[3] Illinois State Museum, Springfield, Illinois 62706
[4] 1619 South Pasfield, Springfield, Illinois 62701

of sampling. At each site, all living and dead-standing trees 10 cm dbh (diameter breast height) and above were identified and their diameters recorded. From the living tree data, the density (stems/ha), basal area (m^2/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. Determination of the IV follows the procedure used by McIntosh (1957), and is the sum of the relative density and the relative dominance of a given species.

In the Turtle Pond Woodlot, the only study site that is not presently heavily grazed, the density (stems/ha) of woody understory species was determined using nested circular plots 0.0001, 0.001, and 0.01 ha in size randomly located along a line transect through the study area. Four additional 0.0001 ha circular plots were located 6 m from each center along the cardinal compass directions. In the 0.0001 ha plots, tree seedlings (<50 cm tall) and all shrubs were counted; in the 0.001 ha plots, small saplings (>50 cm tall and <2.5 cm dbh) were counted; and in the 0.01 ha plots, large saplings (2.5—9.9 cm dbh) were counted. Nomenclature follows Mohlenbrock (1986).

Soils were sampled to a depth of at least 61 cm using a soil probe. Determining the presence or absence of a mollic epipedon was the primary focus during soil sampling. Soil cores were examined at 25 m intervals along line transects through the study areas.

Due to heavy compaction by cattle, some soils could not be adequately sampled and were assumed to be similar to adjacent soils in the same landscape position.

DESCRIPTION OF THE STUDY AREA

The study area is located within a region 3—7 km south of Chatsworth in Livingston County, Illinois (Sections 20, 21, 22, 27, 28, 29, 33, and 34 T26N R8E). The study sites were located at: Gerth's Farm Woodlot (SW1/4 Sec 21), Oliver's Grove Farm Woodlot (NE1/4 Sec 33), and Turtle Pond Woodlot (SW1/4 Sec 34). The South Fork of the Vermilion River (a tributary of the Illinois River) flows through the project area and was channelized in the late 1800s to early 1900s to drain this large wetland for agriculture. According to the General Land Office (GLO) survey records, the original position of the South Fork of the Vermilion River was mostly to the west side of the grove, and extended through an extensive marsh, sedge meadow, and lake (Figure 1). The elevation of the grove is approximately 225 m above mean sea level.

Deep glacial drift deposits are characteristic of this part of Illinois. The Woodfordian substage of the Wisconsin glaciation (the most recent glacial episode) left glacial drift ranging from 61—91 m thick in the study area (Illinois Department of Natural Resources, 2000). This drift is overlain and tempered with about 0.6 m of loess (Wascher et al. 1949). Glacial moraines in or near the study area include the Paxton, Chatsworth, and Gifford moraines that were formed during the Woodfordian substage of glacial advance of the Wisconsinan stage of the Pleistocene Series (Reinertsen et al. 1988, King 1990).

Much of the land surrounding the Oliver's Grove area was dominated by tallgrass prairie, a large portion of which was wet. Sloughs, sedge meadows, marshes, and glacial lakes are common features of the GLO survey records for this region. Pollen from core samples of two glacial lakes near Oliver's Grove has been studied to determine post-glacial climatic and vegetation trends in central Illinois since the last glacial episode. Voss (1937) and King (1981, 1986) characterized the pollen profile of Chatsworth Bog, located 3 km west of Oliver's Grove, while Griffin (1951) characterized the pollen profile of Turtle Pond just south of Oliver's Grove (Figure 1).

Oliver's Grove, at the time of European settlement, was home to the Pottawatomie and Kickapoo Indians, as it was an attractive place with timber and abundant game. The first permanent European settler, Franklin Oliver, moved his family into Kickapoo Grove (which later bore his name) in 1832; they maintained good relations with the Indians. Until the 1850s, Mr. Oliver and his family were the only white settlers in the township (Stoutemeyer 1991). At one time, Mr. Oliver owned as much as 4,000 acres of land including the large parcel of timber, as well as prairie and "swamp" (Haberkorn, no date).

RESULTS

Gerth's Farm Woodlot

The overstory of this upland forest remnant was dominated by bur oak with 33 stems/ha and an average diameter of 64.2 cm dbh. *Carya ovata* (Mill.) K. Koch (shagbark hickory), the only other tree species present, averaged 25.5 stems/ha with an average diameter of 42.8 cm dbh (Table 1). Due to excessive grazing, no woody understory was present, while ground layer vegetation was dominated by cool-season, introduced grasses.

The dominant soil type mapped in the area was a somewhat poorly drained alfisol (forest soil) (Higgins 1996). However, field evaluation of the soil revealed a very dark gray silt loam surface layer (a 30 cm mollic epipedon). This soil was compacted, heavily eroded, and moderately well drained.

Just northeast of Gerth's Farm Woodlot, a large erosional channel exists (Jokulhlaup channel) that was probably formed by water bursting forth from beneath the Chatsworth glacier (Leon Follmer, personal communication). This long, relatively linear wetland contained deep organic soils. This organic soil was mapped as "muck" by Wascher et al. (1949), but is now mapped as Thapto-Histic Fluvaquent (Higgins, 1996), a floodplain soil with a buried organic soil. Up to 0.9 m of mineral soil was overlaying the organic soil, suggesting that eroded sediment from surrounding land had covered the muck. This channel was originally the extensive wetland (shown as a lake in Figure 1) which protected much of Oliver's Grove from recurring prairie fires.

Oliver's Grove Farm Woodlot

The overstory of this lowland forest/savanna remnant was dominated by *Tilia americana* L. (basswood) with 36 stems/ha and an average diameter of 53.1 cm dbh. The other common overstory tree was hackberry with 26 stems/ha, though a few large *Quercus rubra* L. (red oak), some bur oaks and shagbark hickories were present. The large diameters of the red and bur oaks (85.9 and 79.1 cm dbh, respectively) indicate that these species were common components of this forest in the early 1800s, and were probably present in presettlement times. The remaining trees were mostly understory, thorny species (Table 1). Due to excessive grazing, few woody seedlings and saplings were present, while cool-season, introduced grasses dominated the ground layer vegetation.

The soils at this site were mapped as mollisols that ranged from poorly drained to well-drained (Higgins 1996). Field observation of a typical soil core showed a surface layer that was 15 cm of very dark gray and very dark grayish brown silt loam. Therefore, at this smaller scale of evaluation, these soils do not meet the criteria of a mollisol (prairie soil). It is possible that this soil could once have fit the criteria of a mollisol, but erosion resulted in the loss of the thick topsoil (mollic epipedon). Hydric soils were also present in part of this site. The typical soil core of these poorly drained soils had a thick, very dark gray surface. This thick surface layer was probably formed when a small pond or sedge meadow developed in a cut-off meander of the small stream that traverses the study area.

Turtle Pond Woodlot

This woodlot, on a north-facing slope, south of Turtle Pond, was dominated by bur oak with 131 stems/ha and an average diameter of 48.9 cm dbh (Table 1). Many small diameter understory trees were also present. These included *Crataegus mollis* (T. & G.) Scheele (red haw), *Ulmus rubra* Muhl. (slippery elm), *Prunus serotina* Ehrh. (wild black cherry) , and *Maclura pomifera* (Raf.) Schneider (Osage orange), with diameters between 12 and 20 cm dbh. The present owner indicated that the woods was heavily grazed until mid 1950s. This is probably the reason for the presence of the thorny understory trees, as well as the large number of thorny shrubs (Table 2). A few bur oak seedlings were recorded in the woods, but no saplings were encountered. Like most prairie groves, canopy closure due to fire suppression has resulted in many mesic species becoming common, while past grazing has promoted the increase in thorny species.

The dominant soil type mapped at this site was a somewhat poorly drained alfisol (Higgins 1996). Field observations revealed a moderately well drained soil lacking a mollic epipedon. This may have been the result of extensive erosion due to past grazing and agriculture. At mid-slope, the soil surface was a very dark gray to very dark grayish brown silt loam and ranged from 12.7—20.3 cm deep. Further down slope, a very dark gray to dark grayish brown mollic epipedon was present. In the lowland surrounding the pond was an organic soil (histosol) identified as Houghton muck (Higgins 1996).

DISCUSSION

Natural and historical information suggests the Oliver's Grove has significantly decreased in size since the region was settled. The original grove, as shown in the GLO survey maps, was relatively extensive, being 2.4 km across. Topography and wetlands protected the grove until early settlement times when fire frequency decreased. Aerial photographs from the mid to late 1900s show a continual decrease in the number and extent of trees resulting from land-use changes during that time period.

In 1833, the GLO surveyors described a large area east and south of Gerth's Farm Woodlot at various times as lake/marsh/pond/wet area; this and the South Fork of the Vermilion protected much of this region from major fires (Figure 1). In Oliver's Grove, the GLO surveyors encountered a diverse assemblage of many fire-sensitive woody species including black walnut, basswood, elm, and Ohio buckeye. To the west of the wetland, fires were more extreme and fire-tolerant bur oaks dominated.

A cross-section of a 160 year-old bur oak just northeast of Gerth's Woodlot revealed a fire scar from 1871, the year of the Chicago fire. A woman from the area, Mrs. Jane Patton, referred to that time in 1871: "The last days of September, Mr. Patton and I went to Indiana, and came home the first week of October, I think the driest time I ever saw, and a great fire at Chicago the 9th of October made us all feel sad; and forest fires filled the air so full of smoke that you could not see very far." (Gardner 1908).

Prior to European agriculture, fire was a major force determining species distribution. Fire-tolerant bur oak and shagbark hickory dominated the less protected Gerth's Woodlot, while fire-sensitive basswood and hackberry dominated the Oliver's Grove Farm Woodlot, which was protected from fire by an extensive wetland, a small stream, and a low bluff.

The soils of the Oliver's Grove region, like those of most of the prairie peninsula of central Illinois, are predominantly mollisols. These soils mostly developed under grass vegetation that dies back every year, the roots decomposing to form extensive organic matter creating a mollic epipedon. The mollisols found at the Gerth's Farm Woodlot correlated with the present vegetation. Soil-vegetation correlations at Oliver's Grove Farm Woodlot were inconclusive; either the vegetation was grassland and the mollic epipedon had been eroded or the historic vegetation was savanna/forest. At the Turtle Pond Woodlot, in contrast, the absence of a mollic epipedon in part of the area could suggest that the soil is an alfisol and the former vegetation was forest. However, factors other than vegetation can cause the lack of a thick, dark surface horizon. These factors include topography (i.e., a steep slope resulting in surface erosion), and time (i.e., grassland vegetation has just recently been established).

Mollisols usually form beneath grassland vegetation, but may develop during intermixed periods of forest/grassland dominance (Schaetzl, 1991). Therefore, the presence of mollisols does not preclude the existence of former forest vegetation and certainly does not preclude the presence of savanna. Furthermore, Buol et al., (1980) suggest that some well-drained forest soils may have mollic epipedons. That may be the case at the Oliver's Grove Farm Woodlot, where the soils were mapped as well-drained mollisols. Although some speculation may be accurate, direct correlations between soils and vegetation, for the purposes of determining previous vegetation in the Oliver's Grove region, are unreliable. In this study, soils were very useful for estimating former hydrologic characteristics of the region, but could not be used to determine the extent of the pre-settlement grove.

ACKNOWLEDGMENTS

We wish to thank the personnel of the Chatsworth Township Library for their help with historical information about the area; Dwayne Dassow, Hubert Gerth, Kenneth Kurtenbach, Loyd Kemnetz (local farmers) for historical information and access to their land; Leon Follmer (Illinois State Geological Survey) for help with geology; Dave Boomgarden (Natural Resources and Conservation Service) for help with geology, soils, and history; Dan Busemeyer, Dennis Keene, Jesse Kurylo, Loy R. Phillippe and Scott Wiesbrook for reviewing the manuscript.

LITERATURE CITED

Boggess, W. R. and L. W. Bailey. 1964. Brownfield Woods, Illinois: woody vegetation and change since 1925. American Midland Naturalist 71:392—401.

Boggess, W. R. and J. W. Geis. 1966. The Funk Forest Natural Area, McLean County, Illinois: woody vegetation and ecological trends. Transactions of the Illinois State Academy of Science 59:123—33.

Buol, S. W., F. D. Hole, and R. J. McCracken. 1980. Soil Genesis and Classification. Iowa State University Press, Ames. 404 pp.

Gardner, E. A. 1908. History of Ford County, Illinois. The S. J. Clarke Publishing Co., Chicago, Illinois.

Gleason, H. A. 1913. The relation of forest distribution and prairie fires in the middle west. Torreya 13:173—81.

Griffin, C. D. 1951. Pollen analysis of a peat deposit in Livingston County, Illinois. Butler University Botanical Studies 10:90—99.

Haberkorn, L. J. no date. History of Chatsworth, Illinois. Self published, Chatsworth, Illinois.

Higgins, S. K. 1996. Soil Survey of Livingston County, Illinois. USDA Natural Resources Conservation Service in cooperation with the Illinois Agricultural Experiment Station. Soil Report No. 156. 241 pp. + maps.

Illinois Department of Natural Resources, Office of Scientific Research and Analysis. 2000. Vermilion River (Illinois River basin) Assessment Area. Volume 1: Geological Resources. Illinois State Geological Survey, Champaign, Illinois. 81 pp., appendix.

King, J. E., 1981. Late quaternary vegetational history of Illinois. Ecological Monographs 51(1). pp. 43—62.

King, J. E. 1986. Chatsworth Bog: A Woodfordian Kettle. p. 71—75. *In* Follmer, L. R., D. P. McKenna, and J. E. King, (ed.) Quaternary records of central and northern Illinois. Ninth Biennial Meeting, American Quaternary Association, University of Illinois at Urbana-Champaign. Illinois State Geological Survey Guidebook 20. Illinois State Geological Survey, Champaign, Illinois.

King, J. E. 1990. Quaternary records of central and northern Illinois. ISGS Guidebook 20.

LaGesse, V. L., W. E. McClain and J. E. Ebinger 1998. Woody vegetation survey of Sibley Burr Oak Grove Nature Preserve, Ford County, Illinois. Transactions of the Wisconsin Academy of Sciences, Arts and Letters 86: 129—135.

McClain, W. E., V. L. LaGesse, R. L. Larimore, and J. E. Ebinger. 1998. Black soil prairie groves of the headwaters region of east-central Illinois. Transactions of the Wisconsin Academy of Sciences, Arts, and Letters 86: 129—135.

McIntosh, R. P. 1957. The York Woods. A case history of forest succession in southern Wisconsin. Ecology 38:29—37.

Mohlenbrock, R. H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale, Illinois. viii+507 pages.

Reinertsen, D. L., L. R. Follmer, J. M. Masters, and P. C. Reed. 1988. A guide to the geology of the Forrest area, Livingston County. Illinois State Geological Survey Field Trip Guidebook 1988-C, 27 pp., appendix.

Schaetzl, R. J. 1991. Factors affecting the formation of dark, thick epipedons beneath forest vegetation, Michigan, USA. Journal of Soil Science. 42: 501—512.

Schwegman, J. E., M. Hutchison, G. Paulson, G. B. Fell, W. M. Shepherd, and J. White. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2, The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford. 32 pp. + map.

Stoutemeyer, H. L., 1991. Sands of Time. 150 years around Chatsworth, Illinois. HLPS Publishing, Chatsworth, Illinois. 319 pp.

Voss, J. 1937. Comparative study of bog on Cary and Tazewell drift in Illinois. Ecology 18:119-135.

Wascher, H. L., R. S. Smith, and R. T. Odell. 1949. Livingston County Soils. Univ. of Illinois Agricultural Experiment Station Soil Report 72. 56 pp. + maps.

Table 1. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in three woodlots of the Oliver's Grove Region, Livingston County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-70	70+	Total #/ha	Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Ave. Diam. (cm)
Gerth's Farm Woodlot													
Quercus macrocarpa	--	--	0.5	6.5	8.5	6.0	11.5	33.0	11.4	56.4	74.8	131.2	64.2
Carya ovata	--	3.0	5.5	13.5	3.0	0.5	--	25.5	3.8	43.6	25.2	68.8	42.8
Total	--	3.0	6.0	20.0	11.5	6.5	11.5	58.5	15.2	100.0	100.0	200.0	
Oliver's Farm Woodlot													
Tilia americana	0.5	2.0	4.0	8.0	12.0	4.5	5.0	36.0	8.667	24.6	41.3	65.9	53.1
Celtis occidentalis	5.0	5.5	5.0	2.5	1.5	1.0	5.5	26.0	4.995	17.7	23.8	41.5	42.6
Crategus mollis	37.5	5.0	--	--	--	--	--	42.5	0.727	29.0	3.5	32.5	14.2
Quercus rubra	--	--	--	--	--	0.5	3.5	4.0	2.351	2.8	11.2	14.0	85.9
Maclura pomifera	7.5	6.0	1.5	0.5	--	--	--	15.5	0.641	10.6	3.1	13.7	21.9
Quercus macrocarpa	--	--	--	0.5	--	0.5	2.0	3.0	1.559	2.0	7.4	9.4	79.1
Carya ovata	0.5	1.0	4.0	0.5	--	--	--	6.0	0.501	4.1	2.4	6.5	31.8
Juglans nigra	--	--	2.0	1.0	0.5	--	0.5	4.0	0.702	2.8	3.3	6.1	45.3
Gleditsia triacanthos	3.0	0.5	0.5	--	--	0.5	--	4.5	0.293	3.1	1.4	4.5	23.3
Others (6)	--	2.0	0.5	1.0	--	1.0	0.5	--	5.0	0.575	3.3	2.6	5.9
Total	56.0	20.5	18.0	13.0	15.0	7.5	16.5	146.5	21.01	100.0	100.0	200.0	
Turtle Pond Woodlot													
Quercus macrocarpa	3.0	5.0	21.0	47.0	36.0	9.0	10.0	131.0	26.558	40.1	82.8	122.9	48.9
Crataegus mollis	102.0	9.0	--	--	--	--	--	111.0	1.890	33.9	5.9	39.8	14.3
Ulmus rubra	29.0	1.0	--	--	--	--	--	30.0	0.390	9.2	1.2	10.4	12.4
Prunus serotina	18.0	2.0	--	--	--	--	--	20.0	0.363	6.1	1.1	7.2	14.6
Celtis occidentalis	5.0	1.0	2.0	1.0	1.0	--	1.0	11.0	1.173	3.4	3.7	7.1	30.7
Maclura pomifera	9.0	3.0	--	--	--	--	--	12.0	0.310	3.7	1.0	4.7	17.6
Juglans nigra	1.0	--	1.0	3.0	1.0	--	--	6.0	0.789	1.8	2.5	4.3	39.4
Quercus rubra	1.0	1.0	--	--	--	--	1.0	3.0	0.552	0.9	1.8	2.7	41.3
Others (3)	3.0	--	--	--	--	--	--	3.0	0.034	0.9	0.0	0.9	
Total	171.0	22.0	24.0	51.0	38.0	9.0	12.0	327.0	32.059	100.0	100.0	200.0	

Table 2. Densities (stems/ha) of the shrubs, woody vine and tree seedlings (<50 cm tall), small saplings (>50 cm tall <2.5 cm dbh), and large saplings (2.5—9.9 cm dbh) at Turtle Pond Woodlot, Livingston County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings
Tree species			
Prunus serotina	900	850	325
Celtis occidentalis	600	--	--
Quercus macrocarpa	100	--	--
Viburnum prunifolium	300	--	--
Crataegus mollis	--	--	305
Crataegus pruinosa	--	--	100
Maclura pomifera	--	--	5
Zanthoxylum americanum	--	450	--
Ulmus rubra	--	250	190
Totals	1900	1550	925
Shrubs and vines			
Ribes missouriense	1300		
Rosa multiflora	700		
Rubus pensylvanicus	500		
Toxicodendron radicans	400		
Celastrus scandens	200		
Rubus occidentalis	100		
Totals	3200		

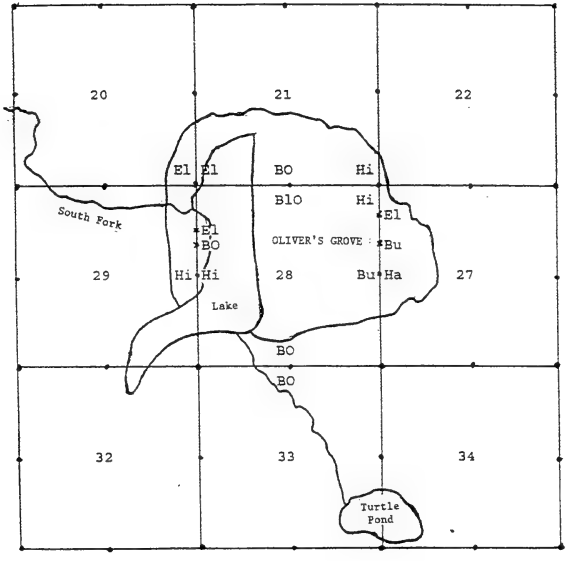


Figure 1. A portion of the plat for T26N R8E that includes Oliver's Grove, just south of Chatsworth, Livingston County, Illinois. The survey of the county was started 13 October 1833 and completed on 22 May 1834 by James Dunn, William Phillips and Washington Atchinson. (BO = bur oak, Blo = black oak, Bu = buckeye, El = elm, Ha = hackberry, Hi – hickory.)

ERIGENIA, Number 20, October 2004, pp. 29—36

BIOTIC AND ABIOTIC EFFECTS ON LICHEN COMMUNITY STRUCTURE IN AN ILLINOIS CEMETERY

Brent Wachholder[1], Matt S. Burmeister[1], Andrew S. Methven[1,2] and Scott J. Meiners[1]

ABSTRACT: The effects of abiotic factors and interspecific interactions on lichen communities were examined on twenty-five dolomitic marble gravestones within Shiloh Cemetery, Coles County, Illinois. Stone height positively associated with species richness and total lichen cover, while proximity to a wooded stream was associated with increased cover of several species. A positive association between *Xanthoria fulva* and *Physcia adscendens* is believed to a true biotic interaction, possibly due to a cooler post-colonization microclimate or photobiont availability. Competition between lichen species appears to be largely mediated by abiotic factors, such as air pollution, humidity, and proximity to sources of colonizing lichens.

INTRODUCTION

Lichen community structure and dynamics are driven by many of the same processes that control larger vascular plant communities, including herbivory, dispersal, competition, and facilitation (John 1989, Lawrey 1991, Hestmark et al. 1997, Meier et al. 2002). However, saxicolous lichen community interactions are not as well understood, as research is hindered by their slow growth and complex holosymbiotic nature (Lawrey 1991, Ahmadjian 1993). While the importance of abiotic environmental factors, such as air pollution and substrate aspect, is well established, there is little direct field evidence for biotic interactions such as competitive exclusion within saxicolous lichen communities (Ferry et al. 1973, Armstrong 1991, Lawry 1991). This study examines the impacts and interactions between biotic and abiotic factors on lichen cover and community composition in an Illinois cemetery.

In Illinois, where exposed stone is geographically rare, cemeteries can be important habitats for saxicolous lichens and grave markers provide the primary substrate for saxicolous lichen species (Hyerczyk 1996; Hyerczyk 1997). Cemeteries also offer several advantages as study sites for lichen community succession; 1) the presence of numerous similar substrates allows replicated sampling; and 2) dates of death on monuments provide a putative date when the stone was first exposed to colonization. Hill (1994) found that lichen communities on calcareous tombstones are colonized within 20 years by four or five aggressive pioneer species and that additional species accumulate at a rate of two per century. However, unlike many plant communities where ruderals are replaced by later successional species, pioneer species typically persist as the community matures. Woolhouse et al. (1985) found that lichen richness and diversity on five natural stone faces increased with age, while cover increased for all but the oldest site where

[1] Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920
[2] Corresponding author, e-mail: asmethven@eiu.edu

senescence of lichens reduced cover. It has been suggested that this persistence is due to recolonization by pioneer species as established lichens fall from the substrate, opening new areas for colonization (Lawry 1991, Hill 1994). Armstrong (1991) determined that competitive interactions between species varied with aspect (direction in which a substrate is facing), another abiotic factor which affects the distribution and abundance of lichen species (Weber and Budel 2001).

In this study, we examined the effects of a number of abiotic factors that alter microclimate conditions and nutrient availability, including aspect, total height of monuments, stone color, placement of monuments beneath overhanging trees, distance from southern and eastern edges of sampling area, and relative elevation. The effect of total stone height was considered because dolomitic rock can buffer acidic precipitation (Saunders and Wood 1973). We investigated stone color because darker colored stones should have a hotter, drier microclimate. Placement of stones beneath overhanging trees could increase availability of nitrogen and other nutrients, especially from increased bird droppings. Position of stones relative to landscape features within the cemetery was considered because distance from roads, streams, and wooded areas can alter microclimate and colonization rates. Elevation was included in the study because higher, more exposed stones will have a drier, hotter microclimate.

Biotic factors considered in the study included interactions between cover of individual species and community descriptors such as total cover and richness, in addition to interactions between pairs of individual species. We hypothesized that lichen cover and richness on dolomitic marble monuments at Shiloh Cemetery would increase with age and that community composition would vary between stones of different color, height, and aspect.

STUDY AREA

Shiloh Cemetery (39°23'24"N, 88°14'08"S; Sec.19 T11N R9E) is located in Coles County, Illinois, approximately 12 km southwest of Charleston. Best known as the burial place of Abraham Lincoln's father and stepmother, it contains granitic and dolomitic marble monuments dating from its establishment in the 1830s to the present day. The cemetery extends to the north and west from Shiloh Church, sloping downhill toward a small creek surrounded by trees and brush (Fig. 1). It is bordered by the Lincoln Heritage Trail to the south and surrounded by a matrix of row crop fields, rural residences, pastures and feedlots. Cemetery monuments to the north of Shiloh Church are primarily polished granitic stones impervious to colonization by lichens; therefore our study was limited to the older, western section dominated by dolomitic marble monuments.

METHODS

We examined lichen communities on twenty-five dolomitic marble gravestones within Shiloh Cemetery. A 10 cm by 20 cm transparent sample grid, divided into two hundred 1-cm^2 squares, was placed 1 meter above the ground on the north- and south-facing sides of each gravestone. The longer axis of the grid was vertically oriented and placed in the center of the stone. All stones sampled were obelisks no more than a few centimeters wider than the sampling grid. Lichen species found within the sampling area were recorded as present on that aspect as a measure of frequency.

The number of 1 cm^2 squares occupied by each lichen species in the sample grid was recorded as a measure of cover. Relative cover was calculated as the fraction of total lichen cover (14,339 cm^2) contributed by a particular species. Relative frequency was calculated as the number of times a species was recorded as present divided by the total number of observations (i.e., fifty different stone faces were sampled, so if five species had observed, and all five were found within every sampling area, the total number of records would be (5 x 50) = 250, and the relative frequency of each species would be (50 / 250) = 0.20). To minimize confounding effects, stones containing carvings or inscriptions within the sampling area were not considered. Stones with angled sides were also rejected. Name of decedent, date of death (carved putative date), stone color (light or dark), and location were recorded. Stones too weathered to be read were identified and dated by consulting records (Coles County Historical Society 1984). Relative elevation for each stone was determined with a surveyor's transit and height pole. Lichens were identified using both morphological characters and chemical tests according to Brodo et al (2001) and Hale (1979). Nomenclature follows Esslinger (1997). Voucher specimens were deposited in the Cryptogamic Herbarium of Eastern Illinois University (EIU).

We statistically examined the effects of aspect, stone color, and location beneath overhanging trees on lichen cover, species richness, and community composition using ANOVA. We used Pearson's product-moment correlation to examine relationships between normally distributed variables, including relative elevation, stone height, stone age, location on north-south axis, and cover of three lichen species. Non-parametric Spearman rank correlations were used for correlations involving all other variables due to non-normal data distributions. Note that this study does not constitute a complete lichen flora of Shiloh Cemetery, as several additional lichen species were observed outside of the sampling areas.

RESULTS

Age of stones ranged from 87 to 124 years, with a mean of 112.2 years. A total of seven foliose species and one crustose species were observed within sampling areas (Table 1), with *Xanthoria fulva*, *Lecanora dispersa*, and *Physciella chloantha* being the dominant species in both relative cover and frequency (Fig. 2).

Abiotic effects

There was no difference in total cover or cover of any individual species between north and south aspects, stones of different colors, or stones with overhanging trees (ANOVA; all $P \geq 0.05$). Spearman rank-sum correlation found no significant relationship between stone age or relative elevation and species richness, total lichen cover or cover of any individual species (all $P \geq 0.05$). There was a positive relationship between distance from the road at the southern edge of the cemetery and total cover ($R = 0.341$, $P = 0.016$), cover of *Physcia adscendens* ($R = 0.467$, $P = 0.001$), cover of *Myelochroa galbina* ($R = 0.320$, $P = 0.023$), and total species richness ($R = 0.381$, $P = 0.006$); see Table 2. Changes in the cover of two species were also associated with location of stones along the east-west axis of the cemetery; cover of *X. fulva* increased on stones to the west ($R = 0.288$, $P = 0.012$), while *P. chloantha* showed the opposite effect ($R = -0.413$, $P = 0.003$). There was also a positive correlation between stone height and total lichen cover ($R = 0.580$, $P < 0.001$). No significant effects were noted for any other abiotic factors.

Biotic effects

Spearman rank-sum correlation found a positive correlation between two pairs of species: *X. fulva* and *P. adscendens* ($R = 0.386$, $P = 0.006$) and *M. galbina* and *P. adscendens* ($R = 0.355$, $P = 0.011$); see Table 3. There was also a negative relationship between *P. adscendens* and *P. chloantha* ($R = -0.461$, $P = 0.001$). *Physcia adscendens* was also positively correlated with stones that had higher total cover ($R = 0.480$, $P < 0.001$), while *P. chloantha* was positively correlated with stone with lower total cover ($R = -0.354$, $P < 0.012$).

DISCUSSION

All lichen communities were in essentially the same seral stage, having an age range of only 37 years. The slow growth rate of saxicolous lichens, relatively even age of stones, and lack of modern dolomitic monuments precluded direct successional interpretations. According to Hill's (1994) observations, however, older stone should have gained one or two additional species, producing some measurable variation in richness or cover due to age. The fact that age was a poor indicator of cover and community structure suggests either a depauperate lichen flora due to historic atmospheric pollution or a historical cleaning of monuments.

The dominance of common, pollution-tolerant lichens and the association between increased lichen cover and stone height suggests that sulfur dioxide or other forms of acid deposition are limiting growth. Increased height of calcareous stone above the sampling area reduces the negative effects of acid deposition, as basic substrates increase the pH of runoff and remove harmful ions from solution (Saunders and Wood 1973). McCune (1988) found that differences in atmospheric sulfur dioxide, a major component of acid precipitation, accounted for 60 to 80 percent of the variability in lichen community structure in Indianapolis, Indiana, USA, where mean annual sulfur dioxide concentrations at seven sites ranged from 23 to 40 $\mu g/m^3$. Levels of sulfur dioxide as low as 5—10 $\mu g/m^3$ can damage sensitive lichens (Will-Wolf 1980b) and changes in lichen community structure have been noted with levels as low as 4 $\mu g/m^3$ (Will-Wolf 1980a).

Atmospheric concentrations of sulfur dioxide have declined throughout central Illinois for the last thirty years due to improved industrial practices and reduced reliance on high-sulfur coal (Illinois Environmental Protection Agency 1974—2002; see Fig. 3). Champaign, Illinois, the nearest state EPA monitoring site (approximately 27 km to the north) reported a mean annual sulfur dioxide concentration of 13.1 $\mu g/m^3$ in 1983, the first year for which data are available (Illinois Environmental Protection Agency 1984). By 2000, the annual mean sulfur dioxide concentration had fallen to 5.2 $\mu g/m^3$, although a level of 10.5 $\mu g/m^3$ was reported as recently as 1997 (Illinois Environmental Protection Agency 1998, 2001).

Lecanora dispersa is one of the most pollution-tolerant lichens and is often a component of lichen communities immediately outside urban "lichen deserts" created by sulfur dioxide pollution (Farkas et al 1985, Brodo 2001). A European congener, *L. conizaeoides* Nyl. ex Crombie, actually increased in abundance in areas of the United Kingdom with high levels of sulfur dioxide pollution (Hawksworth et al 1973). The competitive advantage conferred by its extreme pollution tolerance is so pronounced that *L. conizaeoides* has been erroneously described as sulfur dioxide-requiring (Seaward 1990). We believe that the high frequency of *L. dispersa* is partly attributable to competitive release, as historic high levels of pollution eliminated other lichens from the pool of available species, and to a broad abiotically-facilitated competitive advantage, as current low to moderate levels of pollution continue to favor *L. dispersa*.

Increased cover of *X. fulva* was associated with increased cover of *P. adscendens*. This effect could be due to increased photobiont availability. Lichens reproduce via fragments, isidia, or soredia, which contain both mycobiont and photobiont cells, or through fungal spores which must encounter cells of a suitable photobiont to create a lichen thallus. Since *X. fulva* often produces conidia and both species probably use *Trebouxia* species as their photobiont (Brodo 2001, Dahlkild et al 2001), the presence of *P.*

adscendens may provide a vital reservoir of potential photobiont cells for conidia of *X. fulva*.

Lichen communities can also show biotic threshold effects, where increasing lichen cover changes abiotic conditions and subsequent community structure. Such a biotically facilitated threshold effect may explain the positive correlations between *P. adscendens* and total cover, and cover of both *X. fulva* and *M. galbina*. Hestmark et al. (1997) measured photosynthetic rates across lichen thalli and found that, during periods of heat stress, the center of the thallus often remains photosynthetically active while the outer edges of the thallus are forced into physiological dormancy. Increasing thallus diameter results in lower temperatures and reduced water loss, resulting in greater photosynthetic activity; therefore, contact between the thalli of individual lichens can increase the fitness of both by favorably improving microclimate. We believe that this mechanism, rather than photobiont compatibility, satisfactorily explains the positive correlations between these foliose species, since all of the lichens found share *Trebouxia* as their photobiont.

This same effect may also explain the negative association between *P. chloantha* and total cover and the positive association between *P. adscendens* and total cover. *Physciella chloantha* is well adapted to xeric conditions (McCune et al. 1998). This may make it a superior competitor on dry, exposed stones which *P. adscendens* cannot tolerate, as it is limited to cooler, more heavily colonized areas.

Distance of a monument from the southern and eastern edges of the cemetery was the other significant abiotic factor. We initially suspected this was due to either nitrogen enrichment from nearby agricultural activities, or caused by pollution from the Lincoln Heritage Trail bordering Shiloh Cemetery to the south. Nitrogen enrichment can profoundly alter species composition (Sochting 1995, de Bakker 1989). Since both *P. adscendens* and *Xanthoria* species are pollution-tolerant and highly nitrophytic (Hawksworth 1973, Stringer and Stringer 1974, Armstrong 1991, Richardson 1991, Fenn et al. 2003, Gaio-Oliveira et al. 2004), we hypothesized that cover of these species would increase on stones closer to the road and cattle farm. This was not the case; *P. adscendens* cover increased with distance from the road while *X. fulva* cover was unaffected by location on a north-south axis. Increased richness and cover of lichens to the south, and increased cover of *X. fulva* to the west, may be due to increased humidity from the nearby wooded stream, which aids growth and establishment.

Most of the species observed on gravestones, with the notable exception of *L. dispersa*, are primarily corticolous lichens (Brodo 2001) and none are considered uncommon or rare. The relatively long distance to other significant rock substrates and the proximity of mesic woodlands, combined with decades of moderately high atmospheric sulfur dioxide pollution, has resulted in a facultative saxicolous lichen community dominated by common, pollution-tolerant corticolous lichens. Occasional disturbance of lichen communities (e.g., headstone cleaning) may eliminate species that arrive via infrequent, long-distance or random dispersal events, and thus favor species that can readily recolonize stones from established populations on nearby trees. High relative frequencies and low cover of the five least common species suggests they may be rebounding from intense pollution-facilitated competition as sulfur dioxide levels decrease, although local agricultural inputs may continue to favor nitrophytic lichens. It is also possible that this colonization effect, where the wooded stream served as a reservoir for the primarily lignicolous lichens observed, accounts for the positive relationship between northern and western placement of stones and total cover and species richness. However, the negative relationship between the rather xerophytic *P. chloantha* and proximity to the stream argues that humidity, rather than proximity to source populations, influenced the distribution of this species.

CONCLUSIONS

Air pollution and humidity appear to be the primary factors shaping lichen community structure at Shiloh Cemetery. All of the significant abiotic variables (stone height and distance from the northern and western edges) can be related to air quality. Our results did suggest that biotic interactions, such as facilitation of *P. adscendens* by *X. fulva*, can play an important, though secondary, role. These biotic effects can only be confirmed by additional comparative studies over a much longer period of time.

Human environmental disturbance occurs on a much shorter time scale than lichen growth and succession and, therefore, anthropogenic alterations seem to favor the fastest-growing, weediest species, a development parallel to that seen in agricultural and aquatic systems subject to human disturbance and eutrophication (Fenn et al. 2003). Lichenologists still need to determine whether improved overall air quality will lead to increased richness and diversity or if historic and current pollution and nitrogen enrichment will stall changes in species composition.

ACKNOWLEDGMENTS

The authors wish to thank Chris DeLine, Lynze Greenwood-DeLine, Jennifer Kimmey, Krystal Schrage, and Jamie Jordan for assistance with data collection. We are also very grateful to two anonymous reviewers for their illuminating comments.

LITERATURE CITED

Ahmadjian, V. 1993. *The Lichen Symbiosis.* Hoboken, NJ: Wiley.

Armstrong, R.A. 1991. Competitive interactions between four foliose lichens on north and south facing rock surfaces. *Environmental and Experimental Biology* **31**:51—58.

de Bakker, A. J. 1989. Effects of ammonia emission on epiphytic lichen vegetation. *Acta Botanica Neerlandica* **38**:337—342.

Brodo, I.M., S. Duran-Sharnoff, & S. Sharnoff. 2001. *Lichens of North America.* New Haven, CT: Yale.

Coles County Genealogical Society. 1984. *The Prairie Sleeps: Cemeteries of Coles County, Illinois.* Charleston, IL: Coles County Genealogical Society.

Dahlkild, Å., M. Källersjö, K. Lohtander, & A. Tehlerd. 2001. Photobiont Diversity in the Physciaceae (Lecanorales). *The Bryologist* **104**:527—536.

Esslinger, T. L. 1997. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First Posted 1 December 1997, most recent update 17 July 2002), Fargo, North Dakota.

Farkas, E., Lokos, L., & Verseghy, K. 1985. Lichens as indicators of air pollution in the Budapest agglomeration. *Acta Botanica Hungarica* **31**:45—68.

Fenn, M. E., Baron, J. S., Allen, E. B., Rueth, H. M., Nydick, K. R., Geiser, L., Bowman, W. D., Sickman, J. O., Meixner, T., Johnson, D. W., Neitlich, P. 2003 Ecological Effects of Nitrogen Deposition in the Western United States. *Bioscience* **53**:404—421.

Ferry, B. W., Baddeley, M.S., & Hawksworth, D.L. 1973. *Air Pollution and Lichens,* Athlone: London.

Gaio-Oliveira, G., L. Dahlman K. Palmqvist and C. Maguas. 2004. Ammonium uptake in the nitrophytic lichen *Xanthoria parietina* and its effects on vitality and balance between symbionts. *The Lichenologist* 36(1):75–86.

Hale, M. E. Jr. 1979. *How to know the lichens.* 2nd ed. Dubuque, IA: Wm. C. Brown.

Hawksworth, D. L. 1973. Mapping studies. pp. 38-76 in *Air Pollution and Lichens,* Ferry, B.W., Baddeley, M. S., & Hawksworth, D. L., eds. Athlone: London.

Hestmark, G., B. Schroeter & L. Kappen. 1997. Intrathalline and size-dependent patterns of activity in *Lasallia pustulata* and their possible consequences for competitive interactions. *Functional Ecology* **11**:318-322.

Hill, D. J. 1994. The succession of lichens on gravestones: a preliminary investigation. *Cryptogamic Botany* **4**:179-186.

Hyerczyk, R. D. 1996. The lichen flora of Putnam County, Illinois. *Transactions of the Illinois State Academy of Science* **89**:143—156.

Hyerczyk, R. D. 1997. The lichen flora of Livingston County, Illinois. *Transactions of the Illinois State Academy of Science* **90**:91—101.

Illinois Environmental Protection Agency. 1974—2002. *Illinois Annual Air Quality Report.* Springfield, IL: Illinois Environmental Protection Agency Bureau of Air, Division of Air Pollution Control, Ambient Air Monitoring Section.

John, E. A. 1989. An assessment of the role of biotic interactions and dynamic processes in the organization of species in a saxicolous lichen community. *Canadian Journal of Botany* **67**:2025-2037.

Lawrey, J.D. 1991. Biotic interactions in lichen community development: a review. *The Lichenologist* **23**:205—214.

McCune, B. 1988. Lichen communities along O_3 and SO_2 gradients in Indianapolis. *The Bryologist* 91:223—228.

McCune, B., P. Rogers, A. Ruchty, and B. Ryan. 1998. *Lichen Communities for Forest Health Monitoring in Colorado, USA.* USDA Forest Service Report. fia.fs.fed.us/lichen/pdf%20files/co98_report.pdf.

Meier, F. A., S. Scherrer, & R. Honegger. 2002. Faecal pellets of lichenivorous mites contain viable cells of the lichen-forming ascomycete *Xanthoria parietina* and its green algal photobiont, *Trebouxia arboricola. Biological Journal of the Linnaean Society* **76**:259–268.

Richardson, D. H. S. 1991. *Pollution monitoring with lichens.* Slough, U.K.: Richmond.

Saunders, P. J. W., and C. M. Wood. 1973. Sulfur dioxide in the environment: Its production, dispersal and fate. pp. 6—37 in *Air Pollution and Lichens,* Ferry, B. W., Baddeley, M. S., & Hawksworth, D. L., eds. Athlone: London.

Seaward, M. R. D. 1990. The lichen flora of industrial Teesside. *Naturalist* **115**:73—79.

Sochting, U. 1995. Lichens as monitors of nitrogen deposition. *Cryptogamic Botany* **5**:264—269.

Stringer, P. W., and Stringer, M. H. L. 1974. Air pollution and the distribution of epiphytic lichens and bryophytes in Winnipeg, Manitoba. *Bryologist* 77:405—426.

Weber, B., and B. Büdel. 2001. Mapping and analysis of distribution patterns of lichens on rural medieval churches in north-eastern Germany. *The Lichenologist* **33**:231—248.

Will-Wolf, S. 1980a. Structure of corticolous lichen communities before and after exposure to emissions from a "clean" coal-fired generating station. *The Bryologist* **83**:281—295.

Will-Wolf, S. 1980b. Effects of a "clean" coal-fired generating station on four common Wisconsin lichens. *The Bryologist* **83**:296—300.

Woolhouse, M. E. J., R. Harmsen, and L. Fahrig. 1985. On succession in a saxicolous lichen community. *The Lichenologist* **17**:167—172.

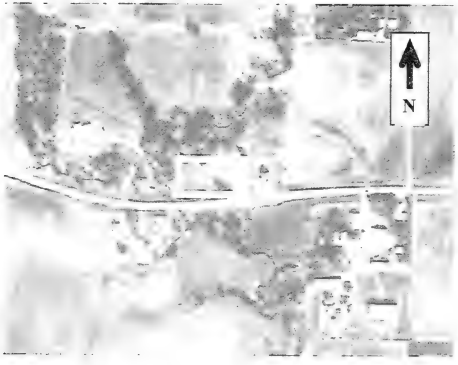


Figure 1. An aerial photograph of Shiloh Cemetery, Coles Co., Illinois. The study area is represented by the white box in the center. Shiloh Church is immediately to the east. A wooded stream bank borders the sampling area to the north and west. The Lincoln Heritage Trail runs from east to west along the southern edge of Shiloh Cemetery.

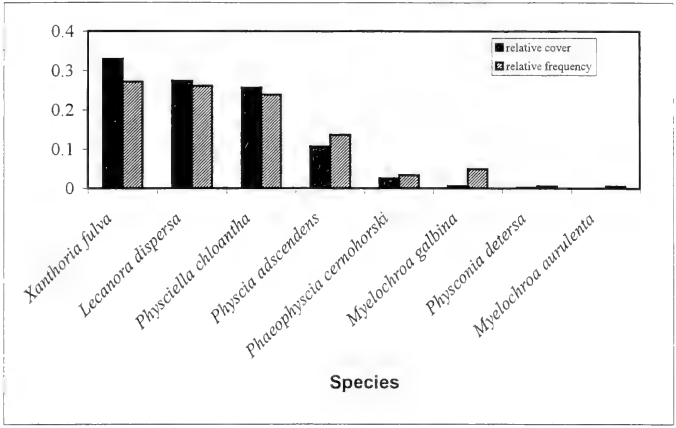


Figure 2: Relative cover and frequency of eight lichen species at Shiloh Cemetery.

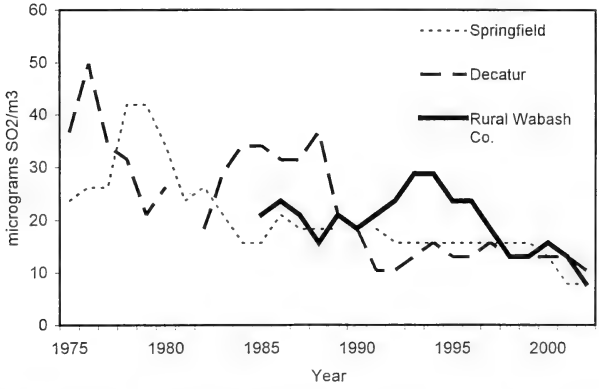


Figure 3: Recent trends in sulfur dioxide emissions at three sites in Illinois. Decatur is 32 km northwest, Springfield is 50 km northwest, and Rural Wabash Co. is 45 km to southeast of Shiloh Cemetery.

Table 1: Lichen species sampled at Shiloh Cemetery, Coles County, Illinois.

Species	Growth form	Percent Frequency
Lecanora dispersa (Pers.) Sommerf.	crustose	96
Myelochroa aurulenta (Tuck.) Elix & Hale	foliose	2
Myelochroa galbina (Ach.) Elix & Hale	foliose	18
Phaeophyscia cernohorskyi (Nádv.) Essl.	foliose	12
Physcia adscendens (Fr.) H. Olivier	foliose	50
Physciella chloantha (Ach.) Essl.	foliose	88
Physconia detersa (Nyl.) Poelt	foliose	2
Xanthoria fulva (Hoffm.) Poelt & Petutschnig	foliose	100

Table 2: Correlations between abiotic factors and community descriptors (species richness and total cover) and between abiotic factors and cover of individual lichen species.

Species/descriptor	Distance from southern edge	Distance from eastern edge	Stone Height
Richness	++	0	0
Total cover	+	0	++
Xanthoria fulva	0	+	0
Lecanora dispersa	0	0	0
Physciella chloantha	0	--	0
Physcia adscendens	++	0	0
Myelochroa galbina	+	0	0

(0) no significant correlation
(+) positive correlation significant at $P < 0.05$
(++) positive correlation significant at $P < 0.01$
(-) negative correlation significant at $P < 0.05$
(--) negative correlation significant at $P < 0.01$

Table 3: Correlations between cover of each major lichen species, total cover, and cover of other major lichen species.

Species	Total cover	pc	pa	mg	xf
Lecanora dispersa	0	0	0	0	0
Xanthoria fulva (xf)	0	0	++	0	
Myelochroa galbina (mg)	0	0	+		
Physcia adscendens (pa)	++	--			
Physciella chloantha (pc)	-				

(0) no significant correlation.
(+) positive correlation significant at $P < 0.05$
(++) positive correlation significant at $P < 0.01$
(-) negative correlation significant at $P < 0.05$
(--) negative correlation significant at $P < 0.01$

ERIGENIA, Number 20, October 2004, pp 37—52

ANALYSIS OF PRAIRIE RESTORATIONS AT ROCK SPRINGS ENVIRONMENTAL CENTER, DECATUR, ILLINOIS

Jennifer A. Ward[1,2], Gordon C. Tucker[1,3], and John E. Ebinger[4]

ABSTRACT: The vegetation of five prairie restorations at Rock Springs Environmental Center was examined during the 1999 to 2001 growing seasons. At this site, five tracts, totaling 12.1 ha, were developed as prairie restorations of varying ages on former farmland starting in 1977. Within these five restorations, 164 plant species were documented, 133 of which were native to Illinois. *Andropogon gerardii* had the highest importance value for all tracts combined with a total of 42.7 (out of 200) followed by *Schizachyrium scoparium* (31.8), *Solidago* spp. (26.4), *Sorghastrum nutans* (16.9), *Chamaechrista fasciculata* (14.5) and *Securigera varia* (12.7). Sorensen's Index of Similarity between the tracts ranged from 53.97 to 72.97, while the Floristic Quality Index (FQI) ranged from 18.6 to 25.8; the overall FQI for all tracts combined was 32.3. An analysis of invasive species showed that *Securigera varia* had a significant negative impact on both species richness and diversity. According to Sorensen's Index of Similarity and cluster diagrams, the tracts are becoming more similar. In addition, based on the FQI, the quality of the flora in the prairie restorations increases with the tract age.

INTRODUCTION

Tallgrass, "black soil" prairie was once common throughout the central United States and adjacent Canada. Although prairies originally covered 61.2% of Illinois, less than 0.01% remains today (Iverson et al. 1991, Ebinger & McClain 1991, Steinauer and Collins 1996). This loss is primarily due to the advent of the self-cleaning steel plow in 1837, and the subsequent conversion of most native vegetation to agricultural usage (Old 1969, McClain 1997). The elimination of fire and the incursion of woody species, particularly non-native exotics, are also factors in the demise of the prairies (McClain 1997, 2003).

Because of increased public interest, prairie restorations and reconstructions are becoming popular and widespread across the midwest (McClain 1997, 2003; Packard and Mutel 1997). Such efforts to restore prairies in Illinois are being hampered by invasive exotic species, especially legumes. Presently, over 960 plant species reported for the Illinois flora (31%) are non-native (Henry and Scott 1980, Harty 1993, Mohlenbrock 2002). Invasion by exotic species is second only to habitat loss as a threat to biodiversity (Zalba et al. 2000).

Our observations indicated that *Securigera varia* (crown vetch, synonym: *Coronilla varia*) is having a significant impact on the prairie restorations at Rock Springs Environmental Center, Macon County, Illinois (RSEC). This species is an invasive herbaceous legume from Europe, northern Africa, and western Asia that was introduced to control soil erosion and as an ornamental ground cover. Presently, it is becoming widely naturalized in Illinois (Mohlenbrock 2002). Because prairie restorations have been undertaken at the RSEC since 1977, and since invasive exotics are a problem here, we decided to analyze the quality and structure of the different age prairie restorations at the RSEC, and determine the impact of crown vetch on species diversity in these restorations.

[1]Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920
[2]Present address: Macon County Conservation District, 3939 Nearing Lane, Decatur, Illinois 62521
[3]Author for correspondence and reprints: gctucker@eiu.edu
[4]Emeritus Professor of Botany, Eastern Illinois University, Charleston, Illinois 61920

DESCRIPTION OF THE STUDY AREA

The Macon County Conservation District acquired the Rock Springs Environmental Center (RSEC) in 1969. This center presently occupies 543.5 ha on the southwest edge of the city of Decatur (Sec 19 T16N R2E; 39° 49.188' N 89° 00.626'W) in Macon County. Before being purchased, most of the upland was farmed, and the surrounding forest degraded by cutting and fire suppression (Ebinger and McClain 1991, McClain and Elzinga 1994, McClain 1997, Davit 1999). The Homestead Prairie Farm, which utilizes prairie restorations as part of their program to educate school children and the general public about early settlement life of central Illinois (Figure 1), is located within the RSEC.

We examined Government Land Office (GLO) survey records to infer the presettlement vegetation of the RSEC region (Gleason and Cronquist 1964; Hutchison 1988). The RSEC and the area for about 2 km in all directions were vegetated by open forests with various species of *Carya* (hickory) and *Quercus* (oak) dominating the uplands while *Acer* (maples and box elder), *Aesculus* (buckeye), and *Ulmus* (elms) were important along the Sangamon River (Figure 2). The closest expanse of prairie was located more than 2 km from the RSEC.

The topography of the RSEC is mostly level to gently rolling uplands with a lowland area at the northwestern edge where the Sangamon River traverses the property. Located on the terminal moraine of Wisconsinan glaciation, the RSEC is in the Grand Prairie Natural Division of Illinois (Schwegman 1973). Most of the vegetation of this division was dry to wet "black soil" prairie found on nearly level ground, while on the more dissected moraines, river valleys, and other hilly areas, the vegetation was dominated by forest (Ebinger and McClain 1991, Anderson 1991). The soil survey of Macon County indicates that the soils of the prairie restorations are of the Miami-Birkbeck-Russell association (Doll 1990). This association is a silt loam, medium color soil that occurs on gently sloping, moderately well-drained areas and indicates prior domination by forest vegetation.

Climate at the RSEC is continental with warm summers and cold winters. Based on the weather data from downtown Decatur (39°51'N 88° 57'W, ca. 4 km to the ENE), the mean annual precipitation is 100.9 cm, with the month of July having the highest rainfall (11.53 cm) and February the lowest, 4.95cm. Mean annual temperature is 11.6 C, with the hottest month being July with a mean of 24.3C, and the coldest January, with a mean of -3.4 C. The lowest temperature ever recorded was -31.3C (13 Feb 1905) and the highest 40.7C (9 Aug 1934). Frost-free days range from 136 to 204 with the mean being 171 (Burroughs 2002; Illinois State Climatologist Office 2002).

Starting in 1977, several prairie restorations, now totaling 12.1 ha, were established on former farmland at the RSEC (Ward 2001). The 1977 restoration totaled 1.6 ha, while subsequent plantings in 1979 (1.6 ha), 1981 (2 ha), 1983 (2 ha), and 1986 (4.9 ha) added to the total (Figure 2). Restorations in 1977 and 1979 were planted mostly in *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (side oats grama). Restorations in 1981, 1983, and 1986 were planted mainly in *Andropogon gerardii* (big bluestem) and *Sorghastrum nutans* (Indian grass). Unfortunately, detailed planting records were not kept, so the exact planting location and original species composition are unknown. The only management undertaken was occasional burns. The 1979, 1981, 1983, and 1986 restorations were last burned in 2001 while the 1977 restoration was last burned in 1997.

METHODS

During the growing season of 1999—2001, five study sites at the RSEC were established and monitored. These study sites were located in five different-aged prairie restorations, and based on the years of establishment, are referred to as: 1977 tract, 1979 tract, 1981 tract, 1983 tract, and 1986 tract. In 1999, all tracts—except the 1977 tract—were analyzed using 1/4 m^2 quadrats along 25 m long transects located randomly in an east/west orientation throughout each tract. Along each transect, the quadrats were located at 1 meter intervals (n = 25/transect). Odd-numbered quadrats were located on the right side of the transects while even-numbered quadrats were located on the left side. A random numbers table was used to determine the number of meters (0 to 9) a quadrat was located from the transect line. Cover was determined by using the Daubenmire canopy cover class system (Daubenmire 1959; Bailey and Poulton 1968; Gotelli and Simberloff 1987), in which class 1 = 0—1%, class 2 = 1—5%, class 3 = 5—25%, class 4 = 25—50%, class 5 = 50—75%, class 6 = 75—95%, and class 7 = 95—100%. In 2000, the same survey procedures were used, except the quadrat was increased in size to 1 m^2.

In 2001, permanent 1 m^2 quadrats were established in each tract by finding a landmark from which a baseline was run. Four parallel 25 m transects were established perpendicular from each baseline, and a random numbers table was used to position six quadrats along each transect. Exact coordinates were obtained for all quadrats using a hand-held GPS unit. Quadrats 1 to 24 are within the 1977 tract, quadrats 25 to 48 are within the 1979 tract, quadrats 49 to 72 are within the 1981 tract, quadrats 73 to 96 are within the 1983 tract, and quadrats 97 to 120 are within the 1986 tract. The transects were sampled once a month from May to September and the all species rooted within the quadrats were identified and their cover determined using the modified Daubenmire canopy cover classes noted above. Specimens were collected while sampling the transects. In addition, all parts of the prairies outside the transects were checked and additional specimens collected to provide a complete species list (Appendix 1). Nomenclature follows Mohlenbrock (2002) while the

determination of non-native taxa was based on Taft et al. (1997) and Mohlenbrock (2002).

From the data obtained, the importance value (IV) for all ground layer species was determined by summing relative cover and relative frequency (total IV = 200). In addition, the Sorensen's Index of Similarity (ISs) was used to determine the degree of similarity among the five tracts (Mueller-Dombois and Ellenberg 1974). As used here, the ISs is calculated by multiplying two times the number of species in common (C) divided by the sum of the species of the two sites being compared (A+B) multiplied by 100 [ISs = 2C/(A+B) x 100].

Also, the Floristic Quality Index (FQI) was determined for each tract using the coefficient of conservatism (CC) assigned to each species by Taft et al. (1997). The CC for each species in the Illinois flora was determined by assigning an integer from 0 to 10 for each species based on its tolerance to disturbance and its fidelity to habitat integrity. As used here, the FQI is a weighted index of species richness (N = number of species present on a tract), and is the arithmetic product of the average coefficient of conservatism (C-Value = the average of all species CC's) multiplied by the square root of the species richness ($\sqrt{N}$) of a tract [FQI = C-Value ($\sqrt{N}$)]. Thus, the FQI indicates the level of habitat degradation and provides an assessment of the quality of each tract based on the taxa present (Masters 1997).

The effects of crown vetch on community structure were summarized using PC-ORD, Version 4 (MjM Software Design, Gleneden Beach, Oregon). Peak abundance data for each species from the 2001 growing season was used and values were computed for species richness, Shannon-Weaver Diversity, and Simpson's Diversity Index. Shannon-Weaver Diversity reflects the variability of a community (Bazzaz 1975, Barbour et al. 1987) and the Simpson's Diversity Index reflects the dominance of abundant species (Barbour et al. 1987). A cluster diagram was also formulated to compare vegetation similarity of individual plots within all of the tracts. This diagram was clustered using Sorensen's Index of Similarity in PC-ORD.

RESULTS

Of the 164 species collected during this project, 56 were encountered within the sampling quadrats. Of the 31 introduced species collected, 10 were present within the sampling transects. The tracts were summarized for an overall comparison. The greatest number of species in a tract (36 out of 56) was found in the 1983 tract and species numbers decreased as follows: the 1981 tract had 35 species, the 1979 tract had 32 species, the 1986 tract had 26 species, and the 1977 tract had 25 species. The highest importance value for any species was 42.6 (out of 200) for *Andropogon gerardii*, a graminoid (grasses, sedges, and rushes) (Table 1). *Solidago* species had the highest importance value (26.4) of all forbs. Sorensen's Index of Similarity between tracts ranged from 53.97 to 72.97 (Table 2). The 1977 and 1981 tracts are the least similar (53.97) and the 1981 and 1983 are the most similar (72.97). The average coefficient of conservatism ranged from 3.42 to 4.56 and the Floristic Quality Index ranged from 18.6 to 25.8. The older sites had higher values (Table 3). The entire site had an average CC of 2.634 for all species, 3.248 for native species only, and FQI of 33.73.

During the 2001 growing season, the 1981 tract had the highest species richness (6.04) and the 1986 tract had the lowest (4.13) (Fig. 3). The effect of *Securigera varia* on community structure was also analyzed, using plots 25 to 120. The 1977 tract was excluded due to the absence of *S. varia*. According to the Pearson correlation, the presence of *S. varia* had a significantly negative effect on species richness: R = -0.262; P = 0.010 (Fig. 4). The Shannon-Weaver Diversity Index (Fig. 5) and the Simpson's Diversity Index (Fig. 6) also revealed a significant decline in species diversity (R = -0.279; P = 0.006 and R =-0.261; P = 0.010, respectively) as a result of *S. varia*. Cluster diagrams in PC-ORD illustrated the separation of 1977 and 1979 tracts and the clustering of the 1981, 1983, and 1986 tracts (Fig. 7).

DISCUSSION

The top five graminoid species are all native prairie grasses, with *Andropogon gerardii* and *Schizachyrium scoparium* having greater importance values than the top forb, *Solidago*. Higher importance values of the graminoids are related to the spring burn regime. Typically, spring burning increases the dominance of warm-season grasses and decreases species richness (Steinauer and Collins 1996). Coefficients of conservatism for the graminoids ranged from 3 to 5. *Andropogon gerardii* and *S. scoparium* both have coefficients of conservatism of 5 and *Sporobolus compositus* (prairie dropseed) has a coefficient of conservatism of 3. A trend in the top five forb species reveals that three are legumes, with *Securigera varia* being an exotic, invasive species. Coefficients of conservatism for the forbs ranged between 0 and 4, with *Solidago* spp. and *Lespedeza capitata* (bush clover) having coefficients of conservatism of 4, *Chamaechrista fasciculata* (partridge pea) and *Calystegia sepium* (bindweed) have coefficients of conservatism of 1, and *S. varia*, 0. The coefficients for the top forb species are much lower than those of the top graminoid species, which indicates that higher-quality forb species are limited when competing with species that can adapt to all habitat conditions. Thinning of the top forb species with coefficients of 1 and 0 could increase the FQIs among all tracts by decreasing competition with conservative species (species that have specialized growth requirements).

Sorensen's Index of Similarity indicates that the tracts are becoming more similar over time. The 1977 tract

stands out as least similar to the other tracts; this could be the result of its isolation from the other plots and the initial difference in graminoids species planted (Table 2). The remaining tracts are adjacent to each other, which resulted in more similarity over time. This could indicate that the tracts are approaching community equilibrium as a result of the movement of species throughout the community and seeding of adjacent tracts.

The cluster diagram (Fig. 7) illustrates the independence of the 1977 and 1979 tracts from the remaining tracts. This separation can be contributed to the type of graminoids planted, with the 1977 and 1979 tracts consisting of shorter graminoids species. The 1977 tract is the most distinct of all the tracts due to the isolation from the remaining tracts. Although the 1979 tract is clustered together, it is more closely related to the 1981, 1983, and 1986 tracts. In addition, the cluster diagram supports the theory of movement of species between tracts with the clustering of the 1981, 1983, and 1986 tracts.

Cumulative results indicate that the tracts are blending together and that, based on the Floristic Quality Index, quality increases with tract age (Fig. 8). The 1977 tract is an exception to the overall trend, since it was sampled one year instead of three years. Using only 2001 FQI data shows a different trend; individual data shows that the 1977 tract has a higher FQI relative to the remaining tracts (Fig. 9). In addition, the 2001 data support the decreasing FQI trend in association with tract age (Table 3). Research has shown that plots with a high fire frequency increase in FQI over time and that plots that are less frequently burned decrease in FQI over time (Masters 1997). This decrease is usually due to the loss of conservative species. Because the 1977 tract has a lower frequency of burning, future analysis will be needed to make a more definitive conclusion.

The FQI allows for the analysis of quality of a floristic ecosystem and can be used to formulate a more specific management plan. A site has high floristic quality if the FQI is above 50, of intermediate quality if the FQI is between 20 and 50, and of poor quality if the FQI is between 0 and 20 (Packard and Ross 1997). Sites with indices greater than 45 are considered statewide-significant Natural Areas, although prairie restorations rarely exceed an FQI of 35 (Taft et al. 1997). Using these values, the 1977 (18.60) and 1986 (19.60) tracts are of poor quality and the 1979 (25.80), 1981 (23.00), and 1983 (20.50) tracts are of intermediate floristic quality. Over time, the tract FQIs may increase and eventually reached an FQI of 35.

Community composition, structure, hydrology, soil fertility, and fire regime can be severely altered by introduced plant species (Walck et al. 1999, White and Schwarz 1998). Burning appears to have very little effect on *S. varia*, as areas where this species is prevalent burn at a lower intensity than the rest of the tracts (Paul Marien, pers. comm.; J. Ward, pers. obs.). Legumes are known to alter the pH and nutrient content of the soil and can potentially have a negative effect on other prairie species. Exotic plants, especially legumes, can change soil chemistry to favor the invader (Campbell 1999). For example, research in Colorado and Minnesota has found that increased levels of nitrogen cause a decrease in native grass diversity (Wilson and Gerry 1995). This decrease is linked to the dependence of arbuscular mycorrhizal fungi found in association with the root systems of virtually all tallgrass prairie plant species (Wilson et al. 2001). *Securigera varia* also had a significant negative impact on species richness and diversity during the 2001 growing season. The slopes of the graphs in Figs. 3, 4, and 5 are all negative and reveal a decrease in diversity and species richness.

This research provides baseline data as well as permanent plots for future study and monitoring of long-term restoration success. In addition, this research will expand the current knowledge of Illinois prairie quality and structure. Research has found that the tracts are becoming more similar over time, as verified by the Sorensen's Index of Similarity and the cluster diagram. In addition, the floristic quality shows an increase as the tracts age. Currently, the tracts are of poor and intermediate quality, but they have the potential to increase to higher qualities over time. FQIs should continue to rise and species richness and diversity may well improve if *Securigera varia* is controlled by management practices. In addition, measures should be taken to promote the increase of more conservative forb species. This site is of sufficient quality and structure to illustrate and teach people about the prairie and Illinois natural history (Ward 2001).

ACKNOWLEDGMENTS

This paper is largely based on a thesis submitted in 2002 by the first author to the Graduate School of Eastern Illinois University in partial fulfillment of the requirements of the degree of Master of Science in Biological Sciences. We thank Scott Meiners for assisting with the ordination program, and for reviewing the manuscript. We would like to thank the staff and volunteers at the Macon County Conservation District, especially Paul Marien, Jeff Tish, and Ross Thompson, for their assistance and effort in helping to complete this project, and Daniel Tucker for help with field work. The first author sincerely thanks friends and family for trudging out into the prairie and supporting her during her college years, and dedicates this paper to the memory of Maude Pschirrer and Ferne Miller, who never stopped believing in her.

LITERATURE CITED

Anderson, R. C. 1991. Presettlement forests of Illinois. pages 9—19 *in* G. V. Burger, J. E. Ebinger, and G. S. Wilhelm, eds. Proceeding of the Oak Woods Management Workshop, Eastern Illinois University, Charleston, Illinois.

Bailey, A. W. and C. E. Poulton. 1968. Plant communities and environmental relationships in a portion of the Tillamook burn, Northwestern Oregon. Ecology 49:1-13.

Barbour, M.G., J. H. Burk, and W. D. Pitts. 1987. Terrestrial plant ecology, 2nd Ed. Benjamin/ Cummings Publishing Company, Inc., Menlo Park, California.

Bazzaz, F. A. 1975. Plant species diversity in old-field successional ecosystems in southern Illinois. Ecology 56: 485—488.

Burroughs, J. 2002. Decatur, Illinois climate averages 1971-2000. Midwestern Regional Climate Center: Champaign, Illinois. (email 04/03/02).

Campbell, F. T. 1999. Noxious weeds and invasive plants. FDCH Congressional Testimony. 06/24/99.

Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33: 43—64.

Davit, C. Ed. 1999. Public prairies of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Doll, J. C. 1990. Soil survey of Macon County, Illinois. USDA, Soil Conservation Service.

Ebinger, J. E. and W. E. McClain. 1991. Forest succession in the prairie peninsula of Illinois. Symposium Proceedings: Our Living Heritage. 34:375—381.

Gleason, H. A. and A. Cronquist. 1964. The natural geography of plants. Columbia University Press, New York.

Gotelli, N. J. and D. Simberloff. 1987. The distribution and abundance of tallgrass prairie plants: a test of the core-satellite hypothesis. American Naturalist 130:18—35.

Harty, F. M. 1993. How Illinois kicked the exotic habitat. Pages 195—209. *In* B. N. McKnight, editor. Biological pollution: the control and impact of invasive exotic species. Indiana Academy of Science, Indianapolis, Indiana.

Henry, R. D. and A. R. Scott. 1980. Some aspects of the alien component of the spontaneous Illinois vascular flora. Transactions of the Illinois Academy of Science 73:35—40.

Hutchison, M. 1988. A guide to understanding, interpreting, and using the public land survey field notes in Illinois. Natural Areas Journal 8:245—255.

Illinois State Climatologist Office. 2002. Illinois State Water Survey, Champaign, Ill. <http://www.sws.uiuc.edu/atmos/statecli/index.htm> (accessed 30 December 2003).

Iverson, L. R., G. L. Rolfe, T. J. Jacob, A. S. Hodgins, and M. R. Jeffords. 1991. Forests of Illinois. Illinois Council on Forest development, Urbana, and Illinois Natural History Survey, Champaign, Illinois.

Masters, L. A. 1997. Monitoring vegetation. Pages 279-301. *In* S. Packard and C. F. Mutel, editors. The tallgrass restoration handbook: for prairies, savannas, and woodlands. Island Press, Washington, D.C.

McClain, W. E. 1997. Prairie establishment and landscaping. Natural Heritage Technical Publication #2. Division of Natural Heritage, Illinois Department of Natural Resources, Springfield, Illinois.

McClain, W. E. 2003. Prairie Establishment and Landscaping. Technical Publication # 2. Revised edition. Division of Natural Heritage. Illinois Department of Natural Resources. Springfield, Illinois 66 pages.

McClain, W. E. and S. L. Elzinga. 1994. The occurrence of prairie and forest fires in Illinois and other midwestern states, 1679-1854. Erigenia 13:79—90.

Mohlenbrock, R. H. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, New York, New York.

Old, S. M. 1969. Microclimate, fire, and plant production in an Illinois prairie. Ecological Monographs 39:355-384.

Packard, S. and L. M. Ross 1997. Restoring remnants. Pages 63—88. In S. Packard and C.F. Mutel, editors. The tallgrass restoration handbook: for prairies, savannas, and woodlands. Island Press, Washington, D.C.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois Nature Preserves System. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois. map+32 pp.

Steinauer, E. M. and S. L. Collins. 1996. Prairie ecology—the tallgrass prairie. In F. B. Samson and F. L. Knopf, editors. Prairie conservation: preserving North America's most endangered ecosystem. Island Press, Washington, D.C.

Taft, J. B., G. S. Wilhelm, D. M. Ladd, and L. A. Masters. 1997. Floristic quality assessment for vegetation in Illinois, a method for assessing vegetation integrity. Erigenia 15:1—95.

Walck, J. L., J. M. Baskin, and C. C. Baskin. 1999. Effects of competition from introduced plants on establishment, survival, growth and reproduction of rare plant *Solidago shortii* (Asteraceae). Biological Conservation 88:312—219.

Ward, J. 2001. Rock Springs Center Prairie Manual. Macon County Conservation District, Decatur, Illinois. 28 pp.

White, P. S. and A. E. Schwarz. 1998. Where do we go from here? The challenges of risk assessment for invasive plants. Weed Technology. 12:744—751.

Wilson, G. W. T., D. C. Hartnett, M. D. Smith, and K. Kobbeman. 2001. Effects of mycorrhizae on the growth and demography of tallgrass prairie forbs. American Journal of Botany 88:142—1457.

Wilson, S. D. and A. K. Gerry. 1995. Strategies for mixed-grass prairie restoration: herbicide, tilling, and nitrogen manipulation. Restoration Ecology 3:290—298.

Zalba, S. M., M. I. Sonaglioni, C.A. Compagnoni, and C. J. Belenguer. 2000. Using a habitat model to assess the risk of invasion by an exotic plant. Biological Conservation 93:203—208.

Table 1: Cumulative importance values of key graminoid and forb species during 1999-2001 growing season. Importance values rank each species according to their importance in the prairie ecosystem. Importance values are out of a total of 200. Top graminoid and forb species where chosen according to decreasing importance value to give an illustration of the dominant composition of this prairie restoration. Graminoids are grasses, sedges, and rushes. Forbs are all other herbaceous flowering plants.

TOP FIVE GRAMINOIDS	IMPORTANCE VALUES
Andropogon gerardii	42.76
Schizachyrium scoparium	31.80
Sorghastrum nutans	16.86
Panicum virgatum	7.18
Sporobolus compositus	0.70

TOP FIVE FORBS	IMPORTANCE VALUES
Solidago spp.	26.40
Chamaechrista fasciculata	14.52
Securigera varia	12.68
Lespedeza capitata	7.18
Calystegia sepium	4.77

Table 2: Cumulative Sorensen's Index of Similarity results during the 1999—2001 growing season. Sorensen's Index of Similarity is used to determine the degree of vegetative similarity between tracts.

	1977	1979	1981	1983
1979	58.62			
1981	53.97	63.77		
1983	60.32	63.77	72.97	
1986	57.69	62.07	69.84	63.49

Table 3: Floristic Quality Index for individual tracts. The Floristic Quality Index (FQI) accesses the quality of the vegetation present with regard to habitat degradation. The average coefficient of conservatism ($\hat{C}$) gives the average coefficients for all species within each tract dependent on required growth conditions of individual species.

	2001		CUMULATIVE	
Tract	$\hat{C}$	FQI	$\hat{C}$	FQI
1977	3.72	18.60	3.72	18.60
1979	4.45	14.80	4.56	25.80
1981	3.36	16.80	3.88	23.00
1983	3.71	17.00	3.42	20.50
1986	3.29	12.30	4.00	19.60

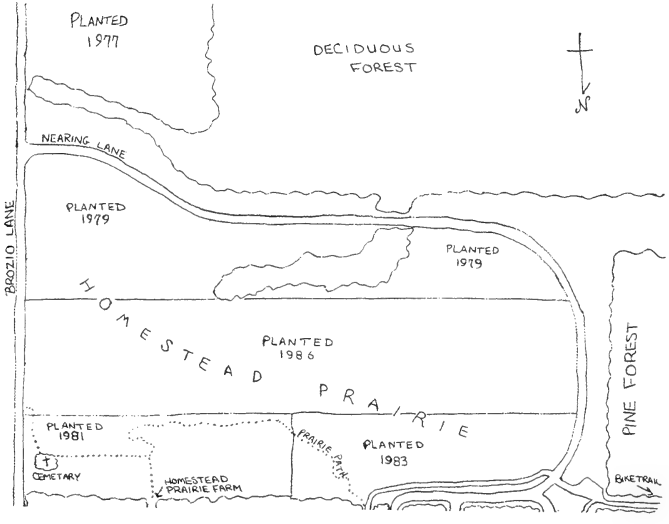
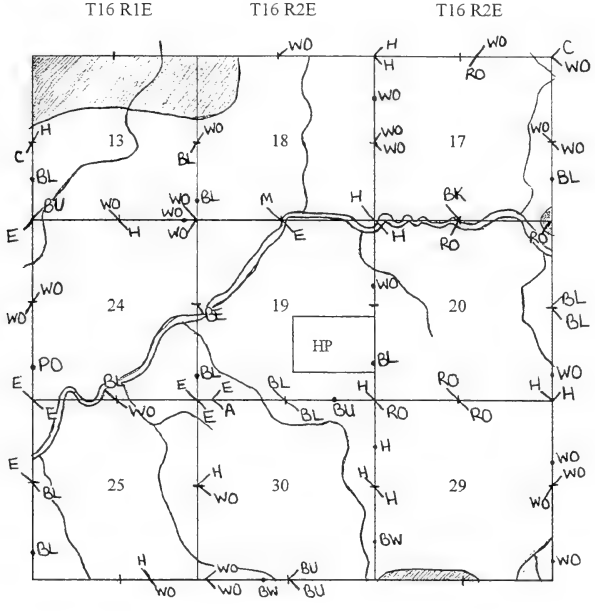


Figure 1: Map of Rock Spring Environmental Center study area (S19 T16N R2E), Decatur, Macon County, Illinois.



Plant Name		Scientific Name
A	Ash	*Fraxinus* sp.
C	Cherry	*Prunus serotina* Ehrh.
BL	Black Oak	*Quercus velutina* Lam.
BW	Black Walnut	*Juglans nigra* L.
BE	Box Elder	*Acer negundo* L.
BK	Buckeye	*Aesculus glabra* Willd.
BU	Bur Oak	*Quercus macrocarpa* Michx.
E	Elm	*Ulmus* sp.
H	Hickory	*Carya* sp.
M	Maple	*Acer* sp.
PO	Pin Oak	*Quercus palustris* Muenchh.
RO	Red Oak	*Quercus rubra* L.
WO	White Oak	*Quercus alba* L.

Various Names and Symbols
HP Homestead Prairie
Sangamon River (==)
Creek (—)
Prairie (////)

Figure 2: Recreated map of original land survey records.

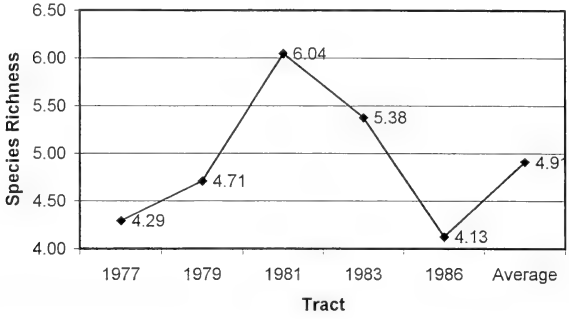


Figure 3: Species richness sampled during the 2001 growing season based on the Daubenmire numbering system.

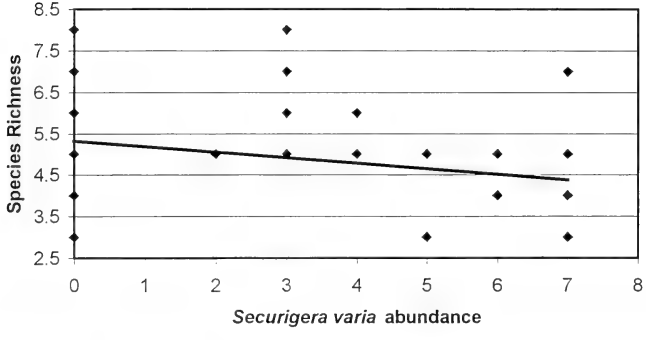


Figure 4: Negative effects of *Securigera varia* on species richness using the Daubenmire number system during the 2001 growing season. $y = -0.1338 x + 5.3119$; $R^2 = 0.0686$

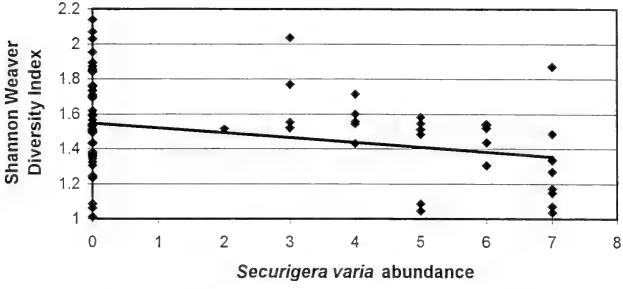


Figure 5: Negative effects of *Securigera varia* on Shannon-Weaver Diversity Index using the Daubenmire number system during the 2001 growing season. Shannon-Weaver Diversity reflects the variability of a community. $y = -0.0277 x + 1.5468$; $R^2 = 0.0778$

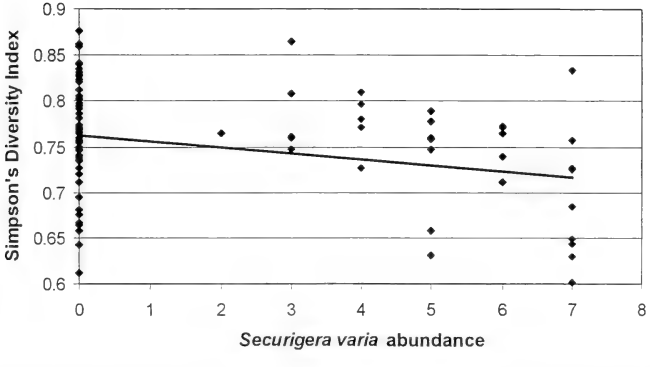


Figure 6: Negative effects of *Securigera varia* on Simpson's Diversity Index using the Daubenmire number system during the 2001 growing season. Simpson's Diversity Index reflects the dominance of the abundant species. $y = -0.0066 x + 0.7623$; $R^2 = 0.0683$.

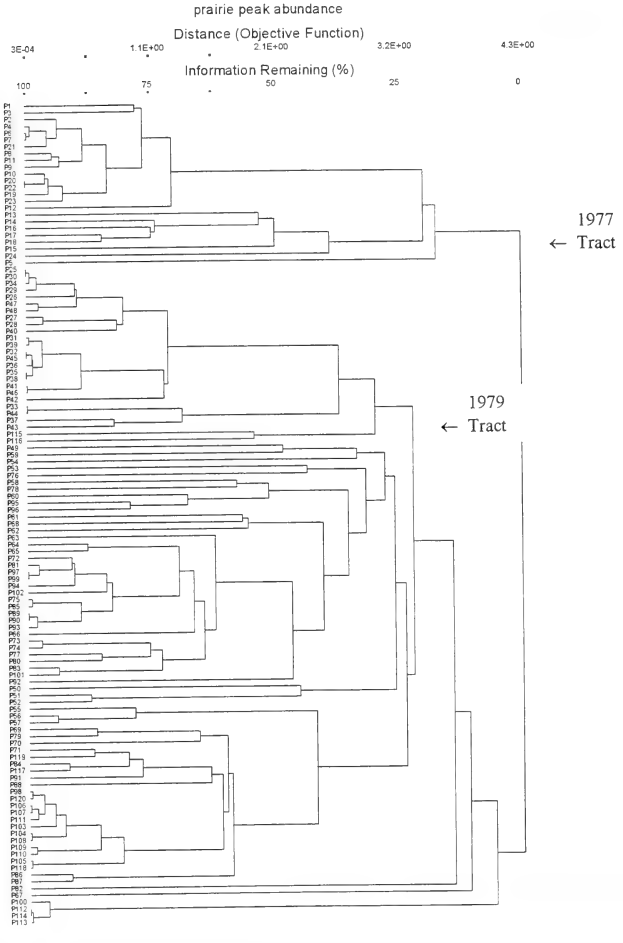


Figure 7: Cluster Diagram of individual plots during the 2001 growing season. The 1981, 1983, and 1986 tracts are located at the bottom and are intermingled together.

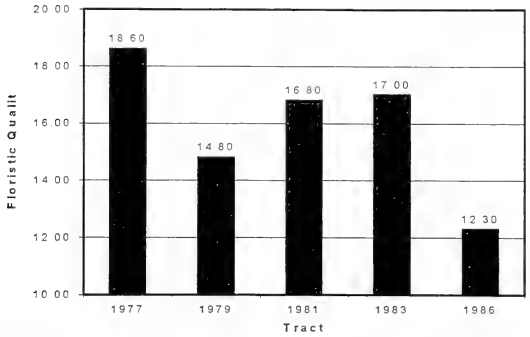


Figure 8: Cumulative Floristic Quality Index of individual tracts at Rock Springs Environmental Center, Macon County, Illinois.

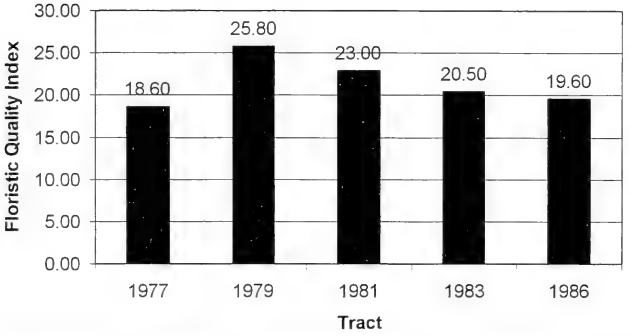


Figure 9: Floristic quality index during the 2001 growing season at Rock Springs Environmental Center, Macon County, Illinois.

Appendix 1

The vascular flora of the Homestead Prairie at Rock Springs Environmental Center, Decatur, Illinois, 1999-2003. Nomenclature follows Mohlenbrock (2002). Non-native species are preceded by an asterisk. Collection numbers for voucher specimens are indicated; those by Ward range from 216 to 334; those by Tucker from 12141 to 13586. All specimens are deposited at the Stover-Ebinger Herbarium, Eastern Illinois University (EIU).

FERNS

DRYOPTERIDACEAE
Woodsia obtusa (Spreng.) Torr., 13574

GYMNOSPERMS

CUPRESSACEAE
Juniperus virginiana L., 13576

DICOTYLEDONEAE

ANACARDIACEAE
Toxicodendron radicans (L.) Kuntze, 12607

APIACEAE
Eryngium yuccifolium Michx., 12610
**Pastinaca sativa* L., 12592
Zizia aurea (L.) Koch, obs.

ASCLEPIADACEAE
Asclepias syriaca L., 12566, 12594
Asclepias tuberosa L., 259

ASTERACEAE
**Achillea millefolium* L., 13564
Ageratina altissima (L.) King & Robins., 12589
Ambrosia artemisiifolia L., 12611
Ambrosia trifida L., 12600
Aster drummondii Lindl., 319
Aster lanceolatus Willd. var. *simplex* (Willd.) A.G. Jones, 12620
Aster lateriflorus (L.) Britt., 12590
Aster novae-angliae L., 12619
Aster pilosus Willd., 317, 12627
Cirsium discolor (Muhl.) Spreng., 12581
Conyza canadensis (L.) Cronq., 12591
Coreopsis lanceolata L., 237
Coreopsis tripteris L., 311, 332
Echinacea pallida (Nutt.) Nutt., 248
Echinacea purpurea (L.) Moench, obs.
Erechtites hieracifolia (L.) Raf., 12599
Erigeron annuus (L.) Pers., 270
Eupatorium altissimum L., 12622
Eupatorium serotinum Michx., 12586
Helianthus mollis Lam., 12615A
Helianthus tuberosus L., 13561
Lactuca canadensis L., 13551
Liatris pycnostachya Michx., 218
Oligoneuron rigidum (L.) Small, 12623
Parthenium integrifolium L., 249, 272
Pseudognaphalium obtusifolium (L.) Hilliard & Burtt., 318, 12628
Ratibida pinnata (Vent.) Barnh., 290
Rudbeckia hirta L., 261, 268
Silphium integrifolium Michx., 279, 12615
Silphium laciniatum L., 289
Silphium perfoliatum L., obs.
Silphium terebinthinaceum Jacq., 12613
Solidago canadensis L., 12613
Solidago juncea Ait., 309
Solidago missouriensis Nutt., 285, 294
Solidago nemoralis Ait., 333
**Taraxacum officinale* Weber, 12617
Vernonia gigantea (Walt.) Trel., 307, 12582

BORAGINACEAE
Myosotis verna Nutt., 239

BRASSICACEAE
Lepidium virginicum L., 238

CAESALPINIACEAE
Chamaechrista fasciculata (Michx.) Greene, 299
Gleditsia triacanthos L., 12585

CAMPANULACEAE
Lobelia siphilitica L., 13571

CANNABINACEAE
Humulus lupulus L., 12137

CAPRIFOLIACEAE
**Lonicera japonica* Thunb., 13579
**Lonicera maackii* (Rupr.) Maxim., 12584
Symphoricarpos orbiculatus Moench, 12595

CARYOPHYLLACEAE
**Dianthus armeria* L., 12149

CONVOLVULACEAE
Calystegia sepium (L.) R. Br., 321

CORNACEAE
Cornus drummondii C.A. Mey., 12588

CORYLACEAE
Corylus americana Walt., 13569

DIPSACACEAE
**Dipsacus fullonum* L., 12143

ELAEAGNACEAE
**Elaeagnus umbellata* Thunb., 13580

EUPHORBIACEAE
Acalypha rhomboidea Raf., obs
Chamaesyce supina (Raf.) Moldenke, 12614
Euphorbia corollata L., 292
Poinsettia dentata (Michx.) Kl. & Garcke, 12596

FABACEAE
Amorpha canescens Pursh, 282, 295
Baptisia alba (L.) Vent. var. *macrophylla* (Larisey) Isely, 260
Dalea candida (Michx.) Willd., 284
Dalea purpurea Vent., 217, 283
Desmodium illinoense Gray, 288
Desmodium sessilifolium (Torr.) Torr. & Gray, 303
Lespedeza capitata Michx., 274, 296
**Lespedeza cuneata* (Dum.-Cours.) G. Don, 291
**Melilotus albus* Medic., 219
**Melilotus officinalis* (L.) Pallas, 13560
Orbexilum onobrychis (Nutt.) Rydb., 12145, 12601
**Securigera varia* (L.) Lassen, 242
**Trifolium campestre* Schreb., 13583
**Trifolium pratense* L., 12616
**Trifolium repens* L., obs.

FAGACEAE
Quercus imbricaria Michx., 13577
Quercus velutina Lam., 12146

GENTIANACEAE
Gentiana alba Muhl., 334

HYPERICACEAE
Hypericum punctatum Lam., 322
Hypericum sphaerocarpum Michx., 12139

LAMIACEAE
Monarda fistulosa L., 267
**Prunella vulgaris* L., 12152
Pycnanthemum pilosum Nutt., 12609
Pycnanthemum tenuifolium Schrad., 220, 280
Pycnanthemum virginianum (L.) Dur. & B.D. Jacks., 12587
Teucrium canadense L., 12624

LAURACEAE
Sassafras albidum (Nutt.) Nees, 13550

MALVACEAE
**Sida spinosa* L., 13554

MORACEAE
**Morus alba* L., 12604

OLEACEAE
Fraxinus americana L., 13552
**Ligustrum obtusifolium* Sieb. & Zucc., 12140

ONAGRACEAE
Oenothera biennis L., 314

OXALIDACEAE
Oxalis stricta L., 12603

PLANTAGINACEAE
Plantago aristata Michx., 12153

POLYGONACEAE
Fallopia scandens (L.) Holub, 13562
**Persicaria cespitosa* (Blume) Nakai, 12608
Persicaria pensylvanica (L.) Small, 13555
**Rumex acetosella* L., 240
**Rumex crispus* L., obs.

ROSACEAE
Fragaria virginiana Duchesne, 13585
Geum canadense Jacq., 13557
Potentilla arguta Pursh, 216, 269
**Potentilla recta* L., 241
**Rosa multiflora* Thunb., 12626
Rubus flagellaris Willd., 12138
Rubus occidentalis L., 300
Rubus pensilvanicus Poir., 286, 12151

RUBIACEAE
Galium triflorum Michx., 13570

SALICACEAE
Populus deltoides Marsh., 13582
Salix interior Rowlee, 13563

SOLANACEAE
Physalis subglabrata Mack. & Bush, 12602
Solanum carolinense L., 12597
Solanum ptychanthum Dunal, 13572

ULMACEAE
**Ulmus pumila* L., 12148
Ulmus rubra Muhl., 13568

URTICACEAE
Boehmeria cylindrica (L.) Sw., 12605

VERBENACEAE
Verbena urticifolia L., 298, 12142

VITACEAE
Vitis aestivalis Michx., 12147
Vitis cinerea (Engelm.) Engelm., 12141
Vitis riparia Michx., 12150

MONOCOTYLEDONEAE

COMMELINACEAE
**Commelina communis* L., obs.
Tradescantia ohiensis Raf., 253, 281

CYPERACEAE
Carex blanda Dewey, obs.
Carex cephalophora Muhl., 326
Carex hirsutella Mack., 323
Cyperus strigosus L., 13581
Scirpus pendulus Muhl., obs.

IRIDACEAE
Sisyrinchium campestre Bickn., obs.

JUNCACEAE
Juncus dudleyi Wieg., 228
Juncus interior Wieg., 271, 325
Juncus tenuis Willd., 297, 331
Juncus torreyi Coville, 13586

ORCHIDACEAE
Spiranthes gracilis (Bigel.) Beck, 12618
Spiranthes lacera (Raf.) Raf., 12618A

POACEAE
Agrostis gigantea Roth, 13565
Andropogon gerardii Vitman, 302, 312
Aristida oligantha Michx., 12583
Bouteloua curtipendula (Michx.) Torr., 313
**Bromus inermis* Leyss., 12144
Dichanthelium acuminatum (Sw.) Gould, 330,12621
Dichanthelium oligosanthes (Schultes) Gould, 13575
**Digitaria ischaemum* (Schreb.) Schreb., 12593A
Elymus canadensis L., 273
Elymus × *ebingeri* G.C. Tucker[1], 293
Elymus virginicus L., 13558
Eragrostis spectabilis (Pursh) Steudel, 13578
**Festuca arundinacea* Schreb., obs.
Panicum capillare L., 144
Panicum dichotomiflorum Michx., 13556
Panicum virgatum L., 328
**Poa pratensis* L. (obs.)
Schizachyrium scoparium (Michx.) Nash, 316
**Setaria faberi* F. Herrm., 12612
**Setaria glauca* (L.) Beauv., 315
Sorghastrum nutans (L.) Nash, 304
Sporobolus compositus (Poir.) Merr., 12593
Sporobolus heterolepis (Gray) Gray, 13553
Tridens flavus (L.) Hitchcock, 12598

SMILACACEAE
Smilax tamnoides L., 12606

[1] The other parent of this hybrid, *E. hystrix* L., was noted in the woods on the northern edge of the Homestead Prairie.

ERIGENIA, Number 20, October 2004, pp. 53—58

IMPORTANT FLORISTIC FINDS FROM DUPAGE COUNTY, ILLINOIS

Scott N. Kobal[1] and Wayne A. Lampa[2]

ABSTRACT: New state, regional and county records, as well as major range extensions in Illinois and new records for state endangered and threatened species are reported for DuPage County, Illinois. A total of 29 species is discussed (1 fern, 22 dicots and 6 monocots), of which 13 are new state records, 8 are new regional records, i.e., not included in Swink and Wilhelm (1994) for the Chicago region, and four are state endangered and threatened species not previously reported for DuPage County. Of the remaining four species, each is known from just one other county in northeastern Illinois, and two of them are known from one additional county outside northeastern Illinois. Of the 29 species described, 23 are introduced exotics.

INTRODUCTION

DuPage County is a rapidly urbanizing county of over 900,000 people, located in northeastern Illinois 15 miles west of downtown Chicago. DuPage is the second most densely populated county in Illinois. Land use in the county consists almost entirely of residential and commercial development, small areas of open space, and rapidly dwindling agricultural land. Most of the remaining open space and natural habitats are found in the 24,400 acres of land owned by the Forest Preserve District of DuPage County (FPDDC).

The county has a rich history of plant collection and identification, going back to the time of Pepoon (1927), who recorded many species from DuPage County. The county also owes much of this legacy to the knowledgeable collectors (Floyd Swink, Ray Schulenberg and Gerould Wilhelm) and meticulously-cataloged herbarium of the Morton Arboretum, Lisle, Illinois. Despite this, new plant records and voucher specimens are continually obtained for this heavily botanized county. This paper documents important new state, regional and county records, as well as major range extensions and new records of state endangered and threatened species, collected by the authors primarily on FPDDC lands.

Nomenclature for all plant species follows either Gleason and Cronquist (1991), Swink and Wilhelm (1994), or Mohlenbrock (2002b). All plant specimens that are mentioned in this report have been deposited in the herbarium at the Morton Arboretum. Distribution information for the Illinois counties in the Chicago Region follows Swink and Wilhelm (1994); for the state of Illinois, it follows Mohlenbrock and Ladd (1978) and Mohlenbrock (2002b). Distribution information for other states comes from Gleason and Cronquist (1991), or USDA, NRCS (2004).

FERN ALLIES

Isoetes butleri Engelm. (Glade Quillwort)
Family: Isoetaceae
Collection Habitat: Dolomite prairie along Des Plaines River
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: May 27, 1999
Collector: Scott N. Kobal (99-06)

Before its discovery in Will County in 1991 (Taylor and Schwegman 1992), *Isoetes butleri* was known only from limestone glades in eastern Kansas east across Missouri to south central Kentucky (Gleason and Cronquist 1991, Swink and Wilhelm 1994). This species was once thought to occur in six counties in extreme southern Illinois in the Shawnee Hills, growing on sandstone (Mohlenbrock, 1967). These reports were apparently based on misidentified specimens of *Isoetes melanopoda* J. Gay & Durieu (Taylor et al. 1976, Mohlenbrock 1999). *I. butleri* occupies seasonably wet spots over limestone and dolomite bedrock in dolomite prairie (Herkert 1994, Swink and Wilhelm 1994). The Illinois population is disjunct from the species' continuous range (USDA, NRCS 2004) and is listed as endangered in the state (Illinois Endangered

[1] Forest Preserve District of DuPage County, P. O. Box 5000, Wheaton, Illinois 60189-5000; author for correspondence
[2] Conservation Research Institute, 375 West First Street, Elmhurst, Illinois 60126

Species Protection Board, 1999). The DuPage County collection represents one of only two counties this species is currently known from in Illinois, as the plant previously was known only from five populations in Will County (Mohlenbrock 1999, Herkert and Ebinger 2002, Mohlenbrock 2002b).

DICOTYLEDONS

Vinca major L. (Greater Periwinkle)
Family: Apocynaceae
Collection Habitat(s): On spoil pile in weedy ground
Locality: Maryknoll Forest Preserve
Initial Collection Date: November 20, 2002
Collector: Scott N. Kobal and Wayne A. Lampa (FPD 02-34)

This native of southern Europe is cited as occasionally escaping from cultivation in the southern United States by Gleason and Cronquist (1991), and rarely in Illinois by Mohlenbrock (2002b). Mohlenbrock (2002b) reports the plant only from Pope County. Swink and Wilhelm (1994) do not record this species for northeastern Illinois.

Anthriscus caucalis M. Bieb. (Bur Chervil)
Family: Apiaceae (Umbelliferae)
Collection Habitat(s): Prairie restoration
Locality: Danada Forest Preserve
Initial Collection Date: June 11, 2001
Collector: Scott N. Kobal (FPD 01-07)

Anthriscus caucalis is a new state record. This European species occurs in 18 states scattered throughout the United States (USDA, NRCS 2004). Swink and Wilhelm (1994) only report this species from Porter and LaPorte counties in northwestern Indiana, where it is an occasional weed of the Indiana Dunes region. Mohlenbrock (2002b) reports this species as newly discovered in Illinois (based on this specimen).

Heracleum mantegazzianum Sommier & Levier (Giant Hogweed)
Family: Apiaceae (Umbelliferae)
Collection Habitat(s): Wooded floodplain near trail
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: June 27, 2001
Collectors: Wayne A. Lampa and Scott N. Kobal (FPD 01-11)

Giant hogweed is a new state record. This native of southwestern Asia has only been reported from five states: Maine, Michigan, New York, Pennsylvania and Washington (USDA, NRCS 2004). Gleason and Cronquist (1991) report that this species is established as a weed in central and western New York and is expected to spread. It is listed as a Federal Noxious Weed (USDA, NRCS 2004). Mohlenbrock (2002b) cites this plant as newly discovered in Illinois based on the above cited specimen.

Acanthopanax sieboldianus Mak. (Five-leaved Aralia, Palmate Hercules' Club)
Family: Araliaceae
Collection Habitat(s): Disturbed floodplain forest, mesic forest
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: June 10, 1997
Collectors: Wayne A. Lampa and Scott N. Kobal (97-12)

Acanthopanax sieboldianus is a new state record. Mohlenbrock (2002b) reports this species as escaped from cultivation in DuPage County (based on this specimen). This shrub is a native to Japan and China and is cultivated as an ornamental in this region. Only pistillate plants are in cultivation in North America so no fruit is produced (Dirr 1998). This species has been reported from only six states (Connecticut, Kentucky, Pennsylvania, Massachusetts, West Virginia and Utah), occurring primarily in the eastern United States (USDA, NRCS 2004).

Hedera helix L. (English Ivy)
Family: Araliaceae
Collection Habitat(s): Wooded floodplain
Locality: Warrenville Grove Forest Preserve
Initial Collection Date: December 12, 2001
Collector: Scott N. Kobal (FPD 01-26)

English ivy is known from 28 states in the contiguous United States (USDA, NRCS 2004). This plant is a native of Europe and is widely cultivated in various forms and occasionally escapes (Gleason and Cronquist 1991). Mohlenbrock and Ladd (1978) and Mohlenbrock (2002b) only report this species from Jackson County. Swink and Wilhelm (1994) do not list it for northeastern Illinois.

Symphyotrichum divaricatum (Nutt.) Nesom (Southern Annual Saltmarsh Aster)
Synonyms: *Aster subulatus* Michx. var. *ligulatus* Shinners
Aster exilis Ell., nomen dubium
Family: Asteraceae (Compositae)
Collection Habitat(s): Disturbed area along lake shoreline
Locality: West Branch Forest Preserve
Initial Collection Date: September 24, 2002
Collector: Scott N. Kobal (FPD 02-37)

Symphyotrichium divaricatum is a new state record. This species is found in 11 states in the south-central and central U.S. (USDA, NRCS 2004). It is a narrow-leaved annual rather similar to *Aster subulatus* Michx., but with better developed rays that evidently surpass the pappus. It is mostly more southern, but has been collected in southeastern Missouri (Gleason 1968).

Lobelia X speciosa Sweet (Hybrid Cardinal Flower)
Synonym: *Lobelia siphilitica* L. var. *hybrida* Hack.
Family: Campanulaceae (Lobeliaceae)
Collection Habitat: Wetland Mitigation Site (in association with *L. cardinalis* and *L. siphilitica*)
Locality: Wood Ridge Forest Preserve
Initial Collection Date: September 13, 2002
Collector: Scott N. Kobal (FPD 02-21)

Lobelia X speciosa is reputed to be a hybrid between *Lobelia cardinalis* L. and *Lobelia siphilitica* L. (Ebinger 1985, Mohlenbrock 1990, 2002b). The species is known from three states; Missouri, Illinois and Indiana (USDA, NRCS 2004). The deep rose flower color and hirtellous calyces of this hybrid distinguish it from its parents (Mohlenbrock 1990). This plant was first found in Illinois by Jacob Schneck, in the late 19th Century, in Wabash County. The only other records for this species in Illinois are from Macoupin and Coles Counties (Ebinger 1985).

Lonicera subsessilis Rehder.
Family: Caprifoliaceae
Collection Habitat(s): Mesic forest
Locality: Fullersburg Woods Forest Preserve
Initial Collection Date: May 19, 1997
Collectors: Victoria A. Nuzzo and Scott N. Kobal (97-10)

Lonicera subsessilis is a new state record. This shrub is a native of Korea, having been introduced to the United States in 1917. It differs from all related species in its 4-merous flowers (Rehder 1940).

Cucurbita pepo L. var. ***ovifera*** (L.) Alef. (Pear Gourd)
Family: Cucurbitaceae
Collection Habitat(s): Disturbed moist ground
Locality: West Branch Forest Preserve
Initial Collection Date: September 7, 1999
Collectors: Wayne A. Lampa and Scott N. Kobal (99-20)

Cucurbita pepo var. *ovifera* is a variety of the common field pumpkin (*Cucurbita pepo* L.) that is grown for the interesting and variable ornamental gourds it produces (Mohlenbrock 1978). Mohlenbrock and Ladd (1978), Mohlenbrock (1978) and USDA, NRCS (2004) report this tropical American species from seven counties in the southern half of Illinois. Swink and Wilhelm (1994) do not cite this species for northeastern Illinois.

Lupinus polyphyllus Lindl. (Bigleaf Lupine)
Family: Fabaceae (Leguminosae)
Collection Habitat(s): Prairie restoration
Locality: Pratt's Wayne Woods Forest Preserve
Initial Collection Date: June 3, 1994
Collector: Scott N. Kobal (94-19)

Bigleaf lupine is a new state record. Gleason and Cronquist (1991) describe this as a western species that has casually escaped from cultivation in northern New England and adjacent Canada. This plant is reported from 14 states, primarily in the northern and western United States (USDA, NRCS 2004).

Lamium galeobdolon (L.) L. (Yellow Archangel)
Family: Lamiaceae (Labiatae)
Collection Habitat(s): Oak woodland
Locality: Wayne Grove Forest Preserve
Initial Collection Date: May 10, 1999
Collector: Scott N. Kobal (99-02)

Lamium galeobdolon is a new state record. This Eurasian ornamental is known from only three states: Massachusetts, New York, and Virginia (USDA, NRCS 2004).

Magnolia stellata (Sieb. & Zucc.) Maxim. (Star Magnolia)
Family: Magnoliaceae
Collection Habitat(s): Shrubby old-field
Locality: Herrick Lake Forest Preserve
Initial Collection Date: November 2, 1994
Collectors: Wayne A. Lampa and Scott N. Kobal (94-38)

Star magnolia is a new state record. This ornamental tree, a native of Asia, is known as an escape only from Ohio in the United States (USDA, NRCS 2004).

Epilobium parviflorum Schreber (Small Flowered Hairy Willow Herb)
Family: Onagraceae
Collection Habitat(s): Marsh
Locality: The Morton Arboretum
Initial Collection Date: August 5, 2002
Collector: Scott N. Kobal (FPD 02-10)

Epilobium parviflorum is a new state record. This European species is known from only three states: Michigan, Ohio and Pennsylvania (USDA, NRCS 2004). Gleason and Cronquist (1991) report that it is introduced in wet places in Michigan and southern Ontario.

Oenothera perennis L. (Small Sundrops)
Family: Onagraceae
Collection Habitat(s): Shrubby wet prairie
Locality: Fischer Woods Forest Preserve
Initial Collection Date: June 26, 2003
Collector: Scott N. Kobal (FPD 03-22)

Oenothera perennis occurs in sand and gravel prairie and on dry rocky prairie slopes and knobs in northern Illinois (Herkert and Ebinger 2002). This state threatened species is cited from only four counties in Illinois, three of these (Lake, Cook and Will) being in northeastern Illinois (Swink and Wilhelm 1994, Herkert and Ebinger 2002). Mohlenbrock (2002b) cites this plant from Cook, Lake, McHenry, Will and Winnebago Counites.

Potentilla intermedia L. (Intermediate Cinquefoil)
Family: Rosaceae
Collection Habitat(s): Prairie restoration
Locality: Glen Oak Forest Preserve
Initial Collection Date: June 23, 1994
Collectors: Wayne A. Lampa and Scott N. Kobal (94-26)

Potentilla intermedia is a native of Eurasia that is found in 21 states in the northeast and midwest (Gleason and Cronquist 1991, USDA, NRCS 2004). This species has been recorded from Champaign, Hamilton and McDonough Counties in Illinois (Mohlenbrock and Ladd 1978, Mohlenbrock 2002b). Swink and Wilhelm (1994) do not cite this species for northeastern Illinois.

Prunus subhirtella Miq. (Higan Cherry)
Family: Rosaceae
Collection Habitat(s): Oak woodland adjacent to the Morton Arboretum
Locality: Hidden Lake Forest Preserve
Initial Collection Date: June 19, 2001
Collector: Scott N. Kobal (FPD 01-08)

Prunus subhirtella is a new state record. This species is native to Eurasia having been introduced from Japan in 1844 (Rehder 1940). This handsome tree is planted as an ornamental and is reported as escaping in the United States only from the state of Ohio (USDA, NRCS 2004).

Pyrus betulaefolia Bunge. (Birch-leaved Pear)
Family: Rosaceae
Collection Habitat(s): Shrubby old-field adjacent to the Morton Arboretum
Locality: Hidden Lake Forest Preserve
Initial Collection Date: July 17, 1995
Collector: Scott N. Kobal (95-37)

Pyrus betulaefolia is a new state record. This fast growing species is native to Asia, was introduced about 1865 and is planted as an ornamental and as a fruit tree (Rehder 1940).

Rosa centifolia L. (Cabbage Rose)
Family: Rosaceae
Collection Habitat(s): Along a hedgerow near a former home site
Locality: Springbrook Prairie Forest Preserve
Initial Collection Date: June 26, 1995
Collector: Scott N. Kobal (95-24)

Rosa centifolia is a new state record. This cultivated rose rarely escapes from cultivation (Gleason and Cronquist 1991). It is reported from eight states: Wisconsin, Michigan, Missouri, New York, New Jersey, Ohio, Pennsylvania and Connecticut (USDA, NRCS 2004).

Rosa virginiana Mill. (Virginia Rose)
Family: Rosaceae
Collection Habitat(s): Marsh edge
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: June 17, 1998
Collector: Scott N. Kobal (98-13)

Rosa virginiana is introduced to the Chicago Region from farther east where it is known only from Lake County (Swink and Wilhelm 1994, Mohlenbrock 2002b). This rose is known from 18 states, mostly in the eastern U.S. (USDA, NRCS 2004), with Missouri being the westernmost edge of its range.

Petunia parviflora A. L. Juss. (Seaside Petunia)
Family: Solanaceae
Collection Habitat(s): Open floodplain along Salt Creek
Locality: Salt Creek Greenway Forest Preserve
Initial Collection Date: October 7, 2003
Collector: Scott N. Kobal (FPD 03-40)

Petunia parviflora is a new state record. This species is mainly subtropical in both North and South America, and is occasionally found north in the northeastern United States as a waif (Gleason and Cronquist 1991). Seaside petunia is known from eight states in the southern and western U. S. and Puerto Rico (USDA, NRCS 2004).

Solanum sarachoides Sendtn. (Hairy Nightshade)
Synonym: *Solanum sarrachoides* Sendtner
Family: Solanaceae
Collection Habitat(s): Disturbed ground
Locality: The Morton Arboretum
Initial Collection Date: July 18, 2000
Collector: Scott N. Kobal (FPD 00-07)

This South American species is very widespread in the United States (USDA, NRCS 2004), occurring in 40 of the 48 contiguous states. Mohlenbrock (1990) reports this plant from St. Clair County based on a collection in 1981. Swink and Wilhelm (1994) cite it only from DeKalb County in northeastern Illinois. Mohlenbrock (2002b) reports this plant as adventive in disturbed soil in DeKalb and St. Clair Counties.

Verbena x engelmannii Moldenke (Engelmann's Vervain)
Family: Verbenaceae
Collection Habitat(s): Prairie and field edges
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: August 24, 2001
Collector: Scott N. Kobal (FPD 01-19)

This plant is reputed to be a hybrid between *Verbena hastata* L. and *Verbena urticifolia* L. (Mohlenbrock 2002b). This plant is known from 24 states in the eastern and midwestern United States (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) and Mohlenbrock (2002b) report this species only from Jackson County. Swink and

Wilhelm (1994) cite this plant from Kankakee County in northeastern Illinois.

MONOCOTYLEDONS

Scirpus hattorianus Makino (Early Dark Green Rush)
Family: Cyperaceae
Collection Habitat(s): Wooded riparian area
Locality: Fullersburg Woods Forest Preserve
Initial Collection Date: October 18, 1994
Collector: Scott N. Kobal (94-37)

Mohlenbrock (2002b) reports this very rare species from Cook, Carroll and Kankakee Counties. Swink and Wilhelm (1994) record this plant from Lake and Kankakee counties in northeastern Illinois. Herkert and Ebinger (2002) record this state endangered species from Lake, DuPage and Kankakee counties. This plant is usually found in moist upland soils with light to moderate shade, whereas *Scirpus atrovirens* Willd., to which it is closely related, grows more commonly in marshes, stream sides and wet meadows (Swink and Wilhelm 1994, Tucker 2000).

Scirpus paludosus A. Nelson (Alkali Bulrush)
Synonyms: *Bolboschoenus maritimus* (L.) Palla
Scirpus maritimus L.
Scirpus maritimus L. var. *paludosus* (A. Nels.) Kuk.
Family: Cyperaceae
Collection Habitat(s): Wetland areas along heavily used roadways
Locality: Fischer Woods Forest Preserve
Initial Collection Date: July 3, 1997
Collector: Scott N. Kobal (97-13)

Scirpus paludosus is a widely distributed plant in the United States, occurring in 35 of the contiguous United States and Alaska and Hawaii (USDA, NRCS 2004). Mohlenbrock (2002b) cites only Cook and LaSalle Counties for this state endangered species. Swink and Wilhelm (1994) consider this species to be introduced from farther west and record it from Lake, Cook and Grundy Counties. Herkert and Ebinger (2002) report this bulrush from Cook, DuPage and LaSalle counties.

Egeria densa Planch. (Brazilian Waterweed, Giant Waterweed)
Synonyms: *Anacharis densa* (Planch.) Vict.
Elodea densa (Planch.) Caspary
Family: Hydrocharitaceae
Collection Habitat(s): Artificial pond
Locality: West DuPage Woods Forest Preserve
Initial Collection Date: October 30, 1996
Collectors: Scott N. Kobal, Wayne A. Lampa and Gerould S. Wilhelm (96-44)

Egeria densa is native of southeastern Brazil and northern Argentina and is commonly cultivated in aquaria and occasionally established in ponds (Gleason and Cronquist 1991). Brazilian waterweed is reported from 33 states in the contiguous United States, as well as Hawaii and Puerto Rico (USDA, NRCS 2004). This species is usually found as an adventive in mine ponds in Illinois and has been reported from the southern Illinois counties of Edwards, Franklin, Jefferson and Williamson (Mohlenbrock and Ladd 1978, Mohlenbrock 2002b). Mohlenbrock (1970) reports that the method of introduction to Illinois waters is at this time unknown, although it is suspected to be the result of aquarium disposals. This represents the first collection of this species in northern Illinois.

Najas minor All. (Brittle Naiad)
Family: Najadaceae
Collection Habitat(s): Quarry pond, wetland restorations and artificial lakes
Locality: Pratt's Wayne Woods Forest Preserve
Initial Collection Date: October 1, 1997
Collector: Scott N. Kobal (97-27)

This species was first discovered in Illinois in 1963 from Lake Murphysboro (Mohlenbrock 1970). *Najas minor* has not previously been reported north of Iroquois County, being occasional to common in the southern two-thirds of the state, but absent elsewhere (Mohlenbrock and Ladd 1978, Mohlenbrock 2002b). This Eurasian species is found in ponds, lakes, and slow-moving streams, often in eutrophic or alkaline waters in 22 states, primarily in the eastern U. S. (Gleason and Cronquist 1991, USDA, NRCS 2004).

Agropyron elongatum (Host) P. Beauv. (Tall Wheat Grass)
Synonyms: *Elytrigia elongata* (Host) Nevski
Elytrigia pontica (Podp.) Holub
Triticum elongatum Host
Family: Poaceae (Gramineae)
Collection Habitat(s): Prairie restorations
Locality: Timber Ridge Forest Preserve
Initial Collection Date: August 8, 2000
Collector: Scott N. Kobal (FPD 00-04)

Agropyron elongatum is introduced from the Mediterranean region and has escaped at scattered locations in the western United States, as well as being locally established in southern Ontario (Gleason and Cronquist 1991). The species is known from 19 states, with Illinois being the only state east of the Mississippi River (USDA, NRCS 2004). Swink and Wilhelm (1994) only record this grass from a single collection made in 1974 in Cook County. Mohlenbrock (2002a,b) also note only one collection from Cook County on disturbed saline soils.

Tripsacum dactyloides (L.) L. (Eastern Gama Grass)
Family: Poaceae (Gramineae)
Collection Habitat(s): Railroad right-of-way
Locality: Waterfall Glen Forest Preserve
Initial Collection Date: September 13, 1995
Collector: Patricia Armstrong

Tripsacum dactyloides is reported by Mohlenbrock (2002b) as occurring occasionally in low ground in the southern two-thirds of the state, but being absent elsewhere. Mohlenbrock and Ladd (1978) do not report this species occurring north of Fulton and Tazewell Counties. Swink and Wilhelm (1994) do not list this species as occurring in the Chicago region.

ACKNOWLEDGMENTS

The authors would like to thank Dr. Gerould Wilhelm and the late Floyd Swink for their tireless and enthusiastic help in identifying specimens over the years, as well as providing encouragement and guidance. We would also like to thank William Hess and Kim Allen, formerly of the Morton Arboretum Herbarium for their work in cataloging and carefully preserving all of the specimens the authors have collected. We thank Rachel Reklau of the Forest Preserve District of DuPage County, for reviewing the manuscript and providing editorial help.

LITERATURE CITED

Ebinger, J. E. 1985. *Lobelia cardinalis* x *L. siphilitica* in Illinois. Transactions of the Illinois Academy of Science 78:29—31.

Dirr, M. A. 1998. Manual of woody landscape plants—their identification, ornamental characteristics, culture, propagation and uses. 5th edition. Stipes Publishing, L.L.C. Champaign, Illinois.

Gleason, H. A. 1968. The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. 4th printing. The New York Botanical Garden, Bronx, New York.

Gleason, H. A. and A. Cronquist. 1991. Manual of vascular plant of northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, New York.

Herkert, J. R. 1994. Endangered and threatened species of Illinois: status and distribution, Volume 3: changes to the Illinois list of endangered and threatened species. Illinois Endangered Species Protection Board, Springfield, Illinois.

Herkert, J. R. and J. E. Ebinger, editors. 2002. Endangered and Threatened Species in Illinois: Status and Distribution, Volume 1—Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 pp.

Illinois Endangered Species Protection Board. 1999. Checklist of endangered and threatened plants and animals of Illinois. Endangered Species Protection Board, Springfield, Illinois.

Mohlenbrock, R. H. 1967. The illustrated flora of Illinois: Ferns. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 1970. Guide to the vascular flora of Illinois: Flowering plants, flowering rush to rushes. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 1978. The illustrated flora of Illinois: Flowering plants, hollies to loasas. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 1990. The illustrated flora of Illinois: Flowering plants, nightshades to mistletoe. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 1999. The illustrated flora of Illinois: Ferns – 2nd edition. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 2002a. The illustrated flora of Illinois: Grasses, *Bromus* to *Paspalum* – 2nd Edition. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. 2002b. Vascular flora of Illinois. Southern Illinois University Press, Carbondale, Illinois.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois vascular plants. Southern Illinois University Press, Carbondale, Illinois.

Pepoon, H. S. 1927. An annotated flora of the Chicago area. Chicago Academy of Science, Chicago, Illinois.

Rehder, A. 1940. Manual of cultivated trees and shrubs hardy in North America. 2nd ed. Macmillan Company, New York.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region. 4th ed. Indiana Academy of Science, Indianapolis.

Taylor, W. C., R. H. Mohlenbrock, and J. Murphy. 1976. The spores and taxonomy of *Isoetes butleri* and *I. melanopoda*. American Fern Journal 65:33—38.

Taylor, W. C. and J. E. Schwegman. 1992. *Isoetes butleri* in Illinois. American Fern Journal 82:82—83.

Tucker, G. C. 2000. Some notable plant records from east-central and southern Illinois. Erigenia 18:75—79.

USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA. 70874-4490. USA

ERIGENIA, Number 20, October 2004, pp 59—66

EFFECTS OF PRESCRIBED BURNING ON THE WOODY UNDERSTORY AT EMMA VANCE WOODS, CRAWFORD COUNTY, ILLINOIS

Bob Edgin[1] and Roger Beadles[2]

ABSTRACT: The overstory composition and effects of prescribed burning on the woody understory were studied at Emma Vance Woods, Crawford County, Illinois, during the 1997 to 2003 growing seasons. The study area is a dry-mesic upland forest located in a presettlement forest-prairie interface zone. Overstory and woody understory sampling were conducted in September 1999. Prescribed burning was conducted in March 2001 and December 2002. Post-burn understory sampling was conducted in September 2003. Increment cores were removed from randomly selected *Quercus alba* L. (white oak) and *Carya* spp. (hickory) trees in December 2003. Increment cores indicated the canopy trees were approximately 150 years old, a date that corresponds to a period of increased settlement in that portion of Crawford County. Tree density averaged 307.5 trees/ha with the dominant species being white oak (IV = 64.4 of 200), followed by *Q. velutina* Lam. (black oak), *Carya tomentosa* (Poir.) Nutt. (mockernut hickory), *C. glabra* (Mill.) Sweet (pignut hickory) and *Sassafras albidum* (Nutt.) Nees (sassafras). Following burning, large sapling (> 2.5 cm dbh and < 10.0 cm dbh) density was reduced from an average of 688 stems/ha to 478 stems/ha (-30.5%) and small sapling (> 50 cm tall and < 2.5 cm dbh) density was reduced from 4,720 stems/ha to 820 stems/ha (-82.6%). Woody seedling (< 50 cm tall) density increased from 38,720 stems/ha to 108,000 stems/ha.

INTRODUCTION

Prior to European settlement, hereafter referred to as presettlement, forest vegetation covered approximately 39% of Illinois with the distribution of the forest types being determined by soil, topography and fire patterns (Iverson et al. 1991). Closed canopy forests usually occurred near streams, areas of rugged topography, or other locations where natural features of the landscape limited fire (Anderson and Anderson 1975, Ebinger 1987). In forest-prairie interface zones and other areas where fire intensity and/or frequency were greater, open woodlands, savannas, and barrens were common.

In east-central Illinois, open oak-hickory woodlands occupied up to 35% of the local presettlement landscape (Edgin 1996, Edgin and Ebinger 1997, Cowell and Jackson 2002). In Crawford County, about 33% of the landscape was prairie and 33% was forest (Edgin and Ebinger 1997) while open woodlands (16%) and barrens (11%) were also common.

Emma Vance Woods is located in Licking Township in the extreme northwest corner of Crawford County. Prior to European settlement, this area contained a mosaic of closed canopy forests, prairies, and open woodlands (Figure 1). *Quercus alba* L. (white oak), *Quercus velutina* Lam. (black oak) and *Carya* spp. (hickories) were common components of the forests with *Ulmus* spp. (elm), *Fraxinus* spp. (ash), *Celtis occidentalis* L. (hackberry) and *Acer saccharum* Marsh. (sugar maple) as lesser associates (General Land Office survey notes). The tallgrass prairies occurred on more level areas or on broad, low ridges and were probably dominated by *Andropogon gerardii* Vitman (big blue stem) (Perrin 1883, Schwegman 1973). Open woodlands usually occurred in areas of rolling topography or forest-prairie interface zones and were dominated by white oak, black oak and hickories (General Land Office survey notes, Edgin and Ebinger 1997). *Corylus americana* Walt. (hazelnut), briars and vines were frequently mentioned as understory components, but grasses, shrubby oaks and *Sassafras albidum* (Nutt.) Nees (sassafras) were also reported (General Land Office survey notes).

[1] Illinois Nature Preserves Commission, 9940 East 500th Avenue, Newton, Illinois 62448, author for correspondence
[2] Rural Route 1, Box 140, Ellery, Illinois 62833

European settlement of Crawford County began at Palestine and Hutsonville in the east-central portion of the county in the early 1800s (Perrin 1883, Selby 1909). Licking Township was first settled by squatters in the 1820s and experienced sporadic settlement until the 1840s when a number of families migrated from Ohio (Selby 1909). Settlement was sporadic through the latter 1800s and extensive prairies persisted in the township through the early 1880s. Dolson prairie, in the eastern part of the township, covered about 520 ha; Willow prairie was 5.6 km long north to south and 4.8 km wide. White's prairie, located near the western border of the township, was 2.5 km wide (Perrin 1883).

During the 1900s, most of the natural communities in Crawford County were lost or altered by clearing, grazing, fire suppression, urbanization and other changes in land use practices. By 1996, 64% of the Crawford County land base had been converted to cropland, the prairies had been eliminated and open woodlands occupied only 0.7% of the landscape (Illinois Department of Natural Resources 1996). Of the open woodlands that remain, many have probably experienced considerable changes in their composition and structure due to timber harvests, natural succession and fire suppression and none have been studied quantitatively.

Emma Vance Woods is located in a presettlement ecotonal area. The site is owned by Lincoln Trail College (LTC), Robinson, Illinois, and is used as an outdoor education area. Prior to this study, no formal studies or quantitative baseline data existed for the site. Prescribed burning was implemented to reduce woody understory stem density, reduce accumulated leaf litter, encourage recruitment of herbaceous species and to restore a more open character to the understory. The purposes of this study were 1) to provide a quantitative description of the woody overstory, 2) to provide a quantitative description of the woody understory vegetation both before and after prescribed burning, and 3) to establish permanent monitoring stations for long term study of the site.

DESCRIPTION OF THE STUDY SITE

Emma Vance Woods (EVW) is a 16.2 ha parcel located about 18 km northwest of Robinson in Crawford County, Illinois, at 39° 06' 50" north latitude; 87° 53' 11" west longitude (Figure 1). The property was donated to The Nature Conservancy around 1980 and ownership was transferred to LTC shortly thereafter (J. Schulte, LTC, pers. comm.). It contains 5.7 ha of dry-mesic upland forest, 4.4 ha of mesic floodplain forest and 6.1 ha of successional forest. The dry-mesic upland forest was the focus of this study.

EVW is located in the Effingham Plain Section of the Southern Till Plain Natural Division of Illinois (Schwegman 1973) and in the east-central edge of Transeau's (1935) prairie peninsula and Anderson's (1983) prairie-forest transition. The climate is continental with hot summers and cold winters. Average temperature ranges from -2.7° C (27.2° F) in January to 24.9° C (76.8° F) in July (Awalt 1996). Average annual precipitation is 95 cm (38 inches) (Awalt 1996).

The surrounding landscape is primarily agricultural with second-growth forests confined to stream corridors or areas that are unsuitable for farming (Figure 1). County roads border the west and north sides of the property. Muddy Creek, a low gradient perennial stream, flows in a southerly direction through the site. The upland forest is west of Muddy Creek.

The study area slopes gently from northwest to southeast. Elevation ranges from 161 m above sea level in the northwest corner to 158 m above sea level in the southeast corner. The soil is Bluford silt loam, a somewhat poorly drained soil that developed on Illinoian till overlain with loess (Awalt 1996). Sandstone fragments are at or near the surface along the east-facing slope that overlooks Muddy Creek.

Prairie vegetation, including big blue stem, *Arnoglossum atriplicifolium* (L.) H. Robins. (Indian plantain), *Coreopsis tripteris* L. (tall coreopsis), *Monarda fistulosa* L. (bee balm), *Orbexilum onobrychis* (Nutt.) Rydb. (French grass), *Phlox pilosa* L. (downy phlox), *Pycnanthemum tenuifolium* Schrad. (slender mountain mint) and *Verbesina helianthoides* Michx. (yellow crownbeard), are common along the north and west sides of the study area. No evidence of recent timber harvest was observed during the study, nor was any present when LTC acquired the property (J. Schulte, LTC, pers. comm.). Prior to March 2001, no management activities had been conducted in the study area since LTC obtained the property. No written or oral written accounts detailing land uses or management activities that may have occurred prior to 1980 could be obtained.

MATERIALS AND METHODS

In September 1999, a 2.25 ha (100 m x 225 m) study area was established in the upland forest. For overstory sampling, the study area was divided into quadrats 25 meters on a side and the species and diameter recorded for all trees >10.0 cm diameter at breast height (dbh). From these data, density (#/ha), basal area (m2/ha), relative density, relative dominance, importance value (relative density + relative dominance = 200) and average dbh were determined for each species. Nomenclature follows Mohlenbrock (2002).

The woody understory was sampled using nested circular plots of 0.01, 0.001, 0.0001 ha located at 12 meter intervals along alternating sides of three transect lines having north-south orientations. Odd-numbered plots were located west of the transect lines, even-numbered plots to the east. The distance from the transect line to the center of each nested plot was determined using a single digit random numbers table. Four additional 0.0001 ha plots were located six meters from the center of each nested plot in each of the cardinal compass directions. The transect

lines were marked with 1 cm steel rods placed at 48 meter intervals and painted fluorescent orange. Large saplings (>2.5 cm dbh and <10.0 cm dbh) were sampled in the 0.01 ha plots (r = 5.64 m, n = 50). Small saplings (>50 cm tall and <2.5 cm dbh) were sampled in the 0.001 ha plots (r = 1.78 m, n = 50) and woody seedlings (< 50 cm tall) were sampled in the 0.0001 ha plots (r = 56.4 cm, n = 250). Density (stems/ha) was determined for large and small saplings and woody seedlings.

Prescribed burning was conducted by staff from the Illinois Nature Preserves Commission (INPC) and Illinois Department of Natural Resources (IDNR) in March 2001 and December 2002. These burns were conducted in early afternoon under clear skies with steady west or northwest winds of 10—16 km/hour. Fire intensity and rate of spread were moderate. Average flame length was 50 cm.

In December 2003, increment cores were removed from five randomly selected white oaks and five hickories using a 30 cm increment borer. After the cores were dried, sanded and stained, they were examined under a binocular microscope to determine the number of annual rings/core and distance between each of the rings.

RESULTS

Overstory sampling

In the overstory sampling, 22 tree species were encountered, averaging 307.5 trees/ha with a basal area of 26.967 m2/ha (Table 1). White oak was the dominant species, with an importance value of 64.4, and was most abundant in the 40+ cm diameter classes. Black oak ranked second in importance value (IV = 35.6) and was present in low numbers in all diameter classes. *Carya tomentosa* (Poir.) Nutt. (mockernut hickory) and *Carya glabra* (Mill.) Sweet (pignut hickory) ranked third and fourth in importance value, respectively, primarily because of their abundance in the smaller diameter classes. Sassafras and sugar maple ranked fifth and sixth, respectively, and were most abundant in the 10—19 cm dbh class. Sassafras was distributed fairly evenly throughout the forest. Sugar maple was restricted to a slope in the southeast corner of the forest. Dead standing trees averaged 12.4 trees/ha with white oak (2.7 trees/ha), sassafras (2.7), pignut hickory (1.8) and black oak (1.3) accounting for most of the total. The average diameter (cm) for each of these species was 25.2, 12.1, 15.0 and 45.3, respectively.

Tree growth form and increment core analysis

None of the canopy trees had limb scars characteristic of open-grown trees and none had a lowest limb less than 8 meters above ground level. The number of annual rings on the white oak cores ranged from 122 to 156 and averaged 134.6 rings/core (Table 2). However, the increment borer was not of sufficient length to reach the center of those trees; so the number of annual rings represents the minimum age of the tree. The number of annual rings on the hickory cores ranged from 133 to 159 and averaged 145.8 rings per core. One hickory tree had a punky center, so the total number of annual rings could not be determined.

During the period of 1844—1935, the average distance between the annual rings was 0.8 mm on the white oak cores and 1.2 mm on the hickory cores (Table 2). Both species experienced a rather dramatic increase in growth rate that began about 1935 and continued until about 1960. During this period, the distance between annual rings on the white oak cores averaged 3.4 mm while the hickories averaged 2.0 mm. A slower growth rate was observed for the period of 1960—2003. During this time period, the average distance between growth rings on the white oak cores was 2.3 mm; the hickories averaged 0.8 mm.

Understory sampling

Pre-burn large sapling density averaged 688 stems/ha with *Ulmus rubra* Muhl. (red elm), sassafras, sugar maple, *Cornus florida* L. (flowering dogwood), and *Cercis canadensis* L. (redbud) being the most abundant (Table 3). Post-burn large sapling density averaged 478 stems/ha with the density of red elm, sassafras and redbud reduced by 44.6%, 58.7%, 50.0%, respectively. Stem density for hickories as a group was not affected by burning, but their percentage of all stems increased from 10.8% prior to burning to 15.1% following burning because of the overall reduction in large sapling density. Oaks were scarce, with only six individuals encountered in both the pre- and post-burn sampling. Most other species experienced only minor changes in stem density.

Pre-burn small sapling density averaged 4,720 stems/ha with red elm, *Asimina trilo*ba (L.) Dunal (pawpaw), ash, sassafras and hackberry being the most abundant (Table 3). Post-burn small sapling density averaged 820 stems/ha with root sprouts of pawpaw, sassafras, *Populus grandidentata* Michx. (big tooth aspen) and *Acer negundo* L. (box elder) being the only species encountered. Small saplings of red elm, which accounted for 52.9% of the pre-burn stems, were not encountered in post-burn sampling.

Pre-burn woody seedling density averaged 38,720 stems/ha with red elm, ash, sassafras, *Carya ovata* (Mill.) K. Koch (shagbark hickory) and hackberry being the most abundant among the tree species and *Viburnum recognitum* Fern. (arrowwood), *Viburnum prunifolium* L. (black haw), hazelnut and *Euonymus atropurpureus* Jacq. (wahoo) the most abundant shrubs (Table 3). Post-burn woody seedling density averaged 108,000 stems/ha with root sprouts of red elm (33.0%), sassafras (12.3%) and pawpaw (7.5) and seedlings of *Vitis* spp.(grape) (21.3%) and hackberry (3.8%) accounting for most of the stems. Grape and hackberry seedlings were usually less than 5 cm tall and were most often encountered near the base of larger trees and under avian perches in canopy gaps. Sugar maple and red maple seedlings increased considerably, probably due to the removal of leaf litter, but most were less than 5 cm tall.

Although no herbaceous sampling was conducted, visual observations revealed very little herbaceous vegetation in the interior of the upland forest prior to burning. *Parthenocissus quinquefolia* (L.) Planch. (Virginia creeper), *Viola* spp. (violets) and scattered clumps of *Carex* spp. (sedges) were the most common species among the thick leaf litter. Following burning, most of the herbaceous species observed were typical of a closed canopy oak-hickory forest and included disturbance-related species such as *Conyza canadensis* (L.) Cronq. (mare's tail), *Phytolacca americana* L. (pokeweed), *Galium* spp. (bedstraw) and *Acalypha rhomboidea* Raf. (three-seeded mercury). A few species typical of more open woodlands, such as *Helianthus divaricatus* L. (woodland sunflower), *Solidago ulmifolia* Muhl. (elm-leaved goldenrod), *Porteranthus stipulatus* (Muhl.) Britt. (Indian physic), and *Monarda bradburiana* Beck. (bee balm) were observed near the edges and in the more open areas. Other species present, but suppressed pre-burn, or observed for the first time in the forest following burning, included *Veronicastrum virginicum* (L.) Farw. (Culver's root), *Eupatorium sessilifolium* L. (upland boneset), *Hedeoma pulegioides* (L.) Pers. (American pennyroyal), *Arnoglossum atriplicifolium* (L.) Robins (Indian plantain) and *Scrophularia marilandica* L. (late figwort). Species having a strong affinity to prairie communities were confined to the north and west edges of the forest.

DISCUSSION

The data derived from the increment cores indicate the canopy trees date back to the 1850s, a date that corresponds to a period of increased settlement in Licking township. The core data also suggest that some activity led to an opening of the canopy and a period of increased basal area production beginning circa 1935. Local historical and weather records give no indication that a natural event, such as a tornado, windstorm, or wildfire occurred during that time frame. Therefore, it seems likely that the increased basal area production may have been stimulated by a selective timber harvest. A selective harvest may also explain the relative lack of trees in 60+ cm diameter class.

Although the study area is located in a presettlement ecotonal region, the canopy trees lacked the characteristic form of open-grown trees. The lack of lower limbs and limb scars also suggest that the canopy trees developed in a closed canopy forest rather than an open woodland. At 307.5 trees/ha, the tree density at Emma Vance Woods is nearly twice that of the presettlement forests of Crawford and neighboring Lawrence County (Edgin and Ebinger 1997, Edgin 1996). The tree density and lack of oaks in the smaller diameter classes at EVW is consistent with results reported from recent studies at Red Hills Woods Nature Preserve in Lawrence County (277 trees/ha) and Big Creek Woods Memorial Nature Preserve in nearby Richland County (370.7 trees/ha) (Edgin and Ebinger 2001, Edgin 2003a).

Hickories as a group were abundant among the smaller diameter trees at EVW, having a combined importance of 47.0. Hickories also accounted for 15.1% of the stems encountered in the post-burn large sapling category, indicating that they will be a major component of the forest in the future. This pattern of hickory recruitment has been observed at other natural areas in southeastern Illinois and appears to be most prevalent in forests near the dry end of the dry-mesic continuum (Edgin et al. 2002, Edgin 2003a, Edgin 2003b).

Conducted in a highly fragmented landscape, the burns at EVW lacked the scale, and perhaps the intensity, of presettlement fires. Infrequent, high intensity fires have a greater capacity to reduce large tree density than frequent, low intensity fires, which tend to reduce woody understory density and stimulate herbaceous recruitment (Nuzzo 1994). Given the position of EVW in the modern landscape, high intensity fires are not possible and it seems unlikely that prescribed burning alone can reduce the density of the canopy trees and large saplings to that of a presettlement open woodland. However, the low intensity burns at EVW substantially reduced large and small sapling density and invigorated many herbaceous species, but root sprouts of red elm, sassafras, pawpaw and ash were common in the seedling category. Jenkins and Jenkins (1996) reported similar findings from a single prescribed burn in which sapling density was initially reduced by 54%, but 92% of the fire-killed hardwood stems resprouted. Frequent burning may be necessary to moderate the abundance of red elm, pawpaw and sassafras.

ACKNOWLEDGMENTS

The authors wish to thank Lincoln Trail College and the Illinois Nature Preserves Commission for granting permission to conduct the study. Sincere appreciation is also extended to Dr. J. E. Ebinger for his thoughts on study design, to Brian Garrard and Tracey Edgin for their assistance in data collection and to two anonymous reviewers whose thoughtful comments greatly improved the manuscript.

LITERATURE CITED

Anderson, R. C. 1983. The eastern prairie-forest transition - An overview. P. 86—92 *in* R. Brewer, ed., Proceedings of the Eighth North American Prairie Conference. Western Michigan University, Kalamazoo, Michigan.

Anderson, R. C. and R Anderson. 1975. The presettlement vegetation of Williamson County, Illinois. Castanea 40:345—363.

Awalt, F. L. 1996. Soils Survey of Crawford County, Illinois. United States Department of Agriculture, Washington, D.C.

Cowell, C. M. and M. T. Jackson. 2002. Vegetation change in a forest remnant at the eastern presettlement prairie margin, U.S.A. Natural Areas Journal 22:53—60.

Ebinger, J. E. 1987. Presettlement vegetation of Coles County, Illinois. Transactions of the Illinois State Academy of Science 80:15—24.

Edgin, B. R. 1996. Barrens of presettlement Lawrence County, Illinois. P. 59—65 in Charles Warwick ed., Proceedings of the 15th North American Prairie Conference, October 23—26, 1996, St. Charles, Illinois.

Edgin, B. R. 2003a. Vascular flora Big Creek Woods Memorial Nature Preserve, Richland County, Illinois. Transactions of the Illinois State Academy of Science 96:179—192.

Edgin, B. R. 2003b. Changes in the woody vegetation at Sandy Branch Woods, Marion County, Illinois from 1976 to 2003. Illinois Nature Preserves Commission report for landowner, Springfield.

Edgin, B. R. and J. E. Ebinger. 1997. Barrens and the forest-prairie interface in presettlement Crawford County, Illinois. Castanea 62:260-267.

Edgin, B. R. and J. E. Ebinger. 2001. Vascular flora of the Red Hills State Park, Lawrence County, Illinois. Transactions of the Illinois State Academy of Science 94:1—19.

Edgin, B. R., R. Beadles, and J. E. Ebinger. 2002. Woody composition and structure of Karcher's Post Oak Woods Nature Preserve, Hamilton County, Illinois. Transactions of the Illinois State Academy of Science 95:251—259.

General Land Office. Survey notes. Volumes 163—166, 174, 176. Illinois State Archives. Illinois State Museum, Springfield, Illinois.

Illinois Department of Natural Resources. 1996. Illinois land cover, an atlas. Illinois Department of Natural Resources, Springfield.

Iverson, L. R., G. L. Rolfe, T. J. Jacob, A. S. Hodgins, and M. R. Jeffords. 1991. Forests of Illinois. Illinois Council on Forest Development, Urbana, and Illinois Natural History Survey, Champaign, Illinois.

Jenkins, M. A. and S. E. Jenkins. 1996. Savanna and glade vegetation of Turkey Mountain, Arkansas: Effects of a single prescribed burn. Pp. 127—134 *in* Charles Warwick ed., Proceedings of the 15th North American Prairie Conference, October 23—26, 1996, St. Charles, Illinois.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois vascular plants. Southern Illinois University Press, Carbondale, Illinois.

Nuzzo, V. A. 1994. Extent and status of midwest oak savanna: Presettlement and 1985. Pp. 1—23 *in* Fralish, J. S., R. C. Anderson, J. E. Ebinger and R. Szafoni, eds., Proceedings of the North American Conference on savannas and barrens, October 15—16, 1994, Normal, Illinois.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2—The natural divisions of Illinois. Illinois Nature Preserves Commission, Springfield, Illinois. 32 pages + map.

Transeau, E. N. 1935. The prairie peninsula. Ecology 16: 423—437.

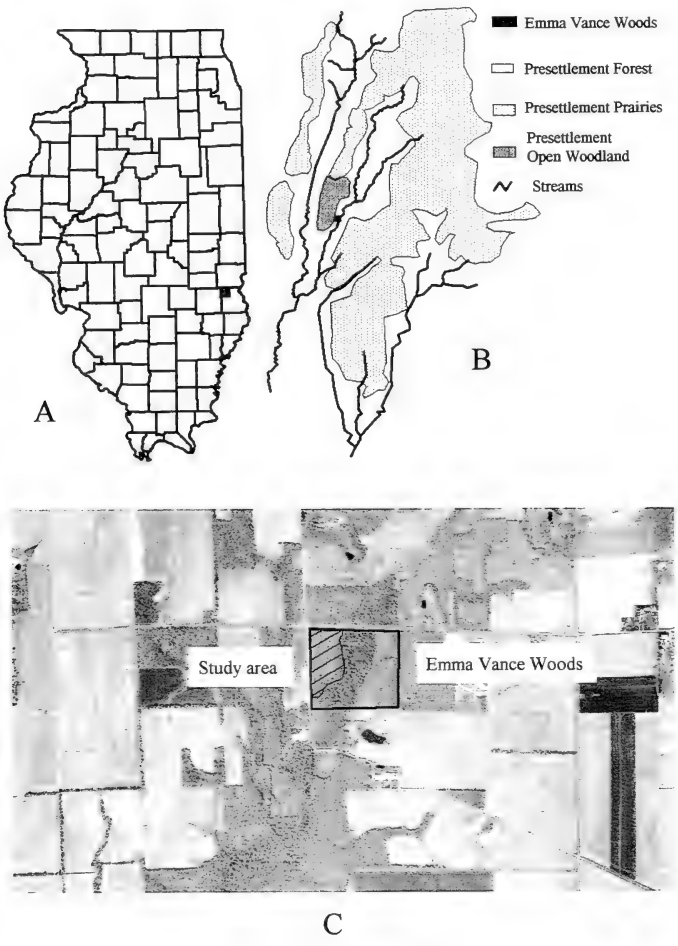


Figure 1. Location of Emma Vance Woods in Crawford County, Illinois (A). Location relative to presettlement prairies (B). Location within the modern landscape (C).

Table 1. Densities (#/ha), diameter classes (cm), basal area (m2/ha), relative values, importance values and average diameters (cm) of trees encountered in the dry-mesic upland forest at Emma Vance Woods, Crawford County, Illinois.

Species	Diameter classes (cm) 10-19	20-29	30-39	40-49	50-59	60+	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Avg. Dia. (cm)
Quercus alba	3.6	4.0	8.4	16.0	19.6	7.9	59.5	10.828	19.3	45.1	64.4	46.2
Quercus velutina	9.8	9.3	11.6	5.8	4.5	4.0	45.0	5.037	14.6	21.0	35.6	34.2
Carya tomentosa	16.0	8.0	10.2	4.9	1.3	—	40.4	2.764	13.1	11.5	24.6	26.9
Carya glabra	24.4	6.7	1.7	2.2	0.8	—	35.8	1.381	11.7	5.8	17.5	19.6
Sassafras albidum	33.3	4.8	0.4	—	—	—	38.5	0.701	12.5	2.9	15.4	14.6
Acer saccharum	24.9	2.6	—	—	—	—	27.5	3.142	9.0	2.1	11.1	14.7
Ulmus rubra	16.0	2.7	0.4	—	—	—	19.1	0.408	6.2	1.7	7.9	15.6
Quercus rubra	1.7	2.6	0.9	0.9	0.8	0.4	7.3	0.767	2.4	3.2	5.6	32.0
Fraxinus americana	4.9	1.8	1.8	—	—	—	8.5	0.670	2.8	1.4	4.2	20.8
Prunus serotina	3.6	2.2	0.9	—	—	—	6.7	0.243	2.2	1.0	3.2	20.2
Carya ovata	3.5	1.3	0.8	—	—	—	5.6	0.196	1.9	0.8	2.7	19.0
Others (11 species)	6.5	4.3	0.8	0.8	0.8	0.4	13.6	0.830	4.3	3.5	7.8	
Totals	148.2	50.3	37.9	30.6	27.8	12.7	307.5	26.967	100.0	100.0	200.0.0	

Table 2. Species, diameter at breast height, core length, and number of annual rings for increment cores collected from 10 trees at Emma Vance Woods in March 2004.

Species	dbh (cm)	Core length (cm)	# of annual rings	Avg. distance between annual rings (mm) 1844-1934	1935-1959	1960-2003
Quercus alba	54.9	26	122	0.7	3.2	2.4
Quercus alba	57.2	27	156	1.3	3.8	1.6
Quercus alba	57.6	23.5	149	0.8	3.1	2.2
Quercus alba	57.9	27.5	133	0.6	3.8	2.0
Quercus alba	74.0	28	122	0.5	3.1	3.1
Carya glabra	37.7	16.5	155	1.3	2.0	0.7
Carya tomentosa	40.1	19.2	151	1.6	1.7	1.0
*Carya tomentosa	41.9	19	133	0.8	2.1	0.2
Carya tomentosa	47.7	22.6	157	0.9	2.1	1.0
Carya tomentosa	50.4	21.3	159	1.3	1.9	1.2
Average distance between annual rings (mm)				1.0	2.7	1.5

* Individual with punky center

Average number of annual rings, *Q. alba* = 134.6, *Carya* spp. = 145.8

Table 3. Pre- and post-burn density (stems/ha) of woody seedlings (< 50 cm tall), shrubs, small saplings (>50 cm tall and <2.5 cm dbh) and large saplings (>2.5 cm dbh and <10.0 cm dbh) in the dry-mesic upland forest at Emma Vance Woods, Crawford County, Illinois.

	Seedlings		Small saplings		Large saplings	
Species	Pre-burn	Post-burn	Pre-burn	Post-burn	Pre-burn	Post-burn
Ulmus rubra	11,800	35,640	2,500	---	296	164
Fraxinus spp.	9,840	7,360	640	---	18	28
Sassafras albidum	2,520	13,320	220	280	126	52
Viburnum recognitum	2,020	1,960	---	---	---	---
Viburnum prunifolium	1,740	840	---	---	---	2
Carya ovata	1,560	1,640	80	---	22	20
Celtis occidentalis	1,480	4,200	200	---	10	8
Prunus serotina	1,360	1,680	60	---	4	2
Carya cordiformis	1,200	1,000	60	---	10	10
Asimina triloba	960	8,080	700	480	8	8
Quercus velutina	760	640	40	---	2	4
Corylus americana	800	1,920	---	---	---	---
Quercus alba	680	520	---	---	4	2
Cornus florida	520	440	---	---	46	54
Carya glabra	320	280	80	---	22	20
Euonymus atropurpureus	260	---	---	---	---	---
Cercis canadensis	240	1,040	---	---	36	18
Acer negundo	160	80	40	20	2	---
Lindera benzoin	140	840	---	---	---	---
Acer saccharum/A. rubrum	120	1120	60	---	56	60
Morus rubra	80	200	20	---	2	---
Carya tomentosa	40	80	---	---	20	22
Staphylea trifolia	80	---	---	---	---	---
Diospyros virginiana	40	---	20	---	2	---
Crataegus mollis	---	440	40	---	---	---
Vitis spp.	---	23,040	---	---	---	---
Celastrus scandens	---	680	---	---	---	---
Smilax spp.	---	520	---	---	---	---
Liquidambar styraciflua	---	360	---	---	---	---
Campsis radicans	---	80	---	---	---	---
Populus grandidentata	---	---	---	40	---	---
Amelanchier arborea	---	---	---	---	2	4
Totals	38,720	108,000	4,760	820	688	478

Erigenia, Number 20, October 2004, pp. 67—97

Illinois Flora Updates 2004

New Distribution Records and Noteworthy Collections

This is the first installment of what we hope will be both a regular and popular feature in *Erigenia*. Two perceptive field botanists deserve recognition for organizing and submitting these records: Scott Kobal, with the Forest Preserve District of DuPage County, and David Ketzner with the Illinois Natural History Survey. The records include some interesting and unusual finds, in addition to many new county distribution reports. Not surprisingly, there are a number of new distribution records for non-native plants; some of these records include known invaders of natural areas. The committee would also thank these reviewers: Dr. L. Rick Phillippe, Illinois Natural History Survey; Mr. David Ketzner, Illinois Natural History Survey; Mr. Eric Ulaszek, USDA Forest Service, Midewin National Tallgrass Prairie, and Ms. Marty Vogt, *Erigenia* staff. The Illinois Flora Updates is off to great start, and again, we encourage all members to consider submitting new finds for the next edition of *Erigenia*.

—Flora Updates Committee, Illinois Native Plant Society

Illinois Flora Updates 2004: new distribution records and noteworthy collections

Scott N. Kobal
Plant Ecologist, Forest Preserve District of DuPage County

Citation: Kobal, S. 2004. Illinois Flora Updates: New distribution records and noteworthy collections: *Erigenia* 20:67—97.

Scientific Name: *Acanthopanax sieboldianus* Makino
Identification Manual (Source of nomenclature): USDA, NRCS 2004
Common Name: Five-leaved Aralia
Family: Araliaceae
County: DuPage
Date of Collection: 10 June 1997
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: 97-12
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 135642
Locality information: Waterfall Glen Forest Preserve
Habitat: Fully naturalized colony in a disturbed floodplain area.
Associates: *Acer negundo, Actinomeris alternifolia, Alliaria petiolata, Allium canadense, Circaea lutetiana* var. *canadensis, Eupatorium rugosum, Galium aparine, Geum canadense, Gleditsia triacanthos, Pilea pumila, Polygonum virginianum, Ranunculus septentrionalis,* and *Robinia pseudoacacia.*
Comments on population size: Fairly large colony noted.
Information published elsewhere: Mohlenbrock (2002) reports this species as escaped from cultivation in DuPage County based on this record.
Significance: New state record.
Species Native or Alien: Alien – native of Asia

Scientific Name: *Aegilops cylindrica* Host
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Jointed Goat Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 24 June 2003
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: FPD 03-19
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155763
Locality information: Waterfall Glen Forest Preserve near Lemont.
Habitat: The plants were found growing in the railroad ballast along the Santa Fe Railroad tracks.
Associates: *Alliaria petiolata, Arctium minus, Chaenorrhinum minus, Cirsium arvense, C. vulgare, Coronilla varia, Erigeron canadensis, Galium aparine, Lychnis alba, Nepeta cataria, Parthenocissus inserta, Poa compressa, Polygonatum canaliculatum, Polygonum scandens, Rubus occidentalis, Tradescantia ohiensis,* and *Verbascum thapsus.*
Comments on population size: Small number of plants seen (8-10).
Information published elsewhere: No
Significance: New county record. The species is uncommon in the Chicago Region, usually found in railroad ballast or waste ground (Swink and Wilhelm 1994).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Aethusa cynapium* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Fool's Parsley
Family: Umbelliferae (Apiaceae)
County: DuPage
Date of Collection: 16 August 1999
Collector's Name: Scott N. Kobal
Collection Number: 99-19
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 124445
Locality information: Greene Valley Forest Preserve near Woodridge.
Habitat: Collected in a weedy area near an old residence.
Associates: *Bromus inermis, Cirsium vulgare, Geum canadense, Hackelia virginiana, Hemerocallis fulva, Hesperis matronalis, Leonurus cardiaca, Phlox paniculata, Phytolacca americana, Pilea pumila, Solanum americanum* and *Vitis riparia.*
Comments on population size: Small number of plants seen (15-20).
Information published elsewhere: No
Significance: New county record. Mohlenbrock (2002) cites this Eurasian native as rarely escaping from cultivation in disturbed soil and reports it from Cook and Kane Counties. Swink and Wilhelm (1994) add Kendall County to this list. Fool's parsley is known from 17 states in the United States, primarily in the northeast and upper midwest (USDA, NRCS 2004)
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Agropyron elongatum* (Host) P. Beauv.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Tall Wheat Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 8 August 2000
Collector's Name: Scott N. Kobal
Collection Number: FPD 00-04
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 149867
Locality information: Timber Ridge Forest Preserve
Habitat: Prairie Restoration
Associates: *Acer negundo, Ambrosia artemisiifolia* var. *elatior, A. trifida, Aster pilosus, Daucus carota, Elymus canadensis, Erigeron annuus, Hordeum jubatum, Melilotus alba, Rhamnus cathartica, Solidago canadensis, Sorghastrum nutans,* and *Vitis riparia.*
Comments on population size: Small, only a few clumps seen
Information published elsewhere: No
Significance: New county record – this species previously was known from only one collection made in 1974 in Cook County (Mohlenbrock 2002, Swink and Wilhelm 1994). Since the initial collection the plant has been collected at two other forest preserves in DuPage County.
Species Native or Alien: Alien – introduced from the Mediterranean region.

Scientific Name: *Andropogon saccharoides* Sw.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Silver Beard Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 18 November 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-33
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155111
Locality information: Waterfall Glen Forest Preserve
Habitat: Several plants were noted growing along the edge of a gravel road adjacent to a natural gas pipeline right-of-way where a water pipeline had recently been installed. The area was seeded in May 2000.

Associates: *Ambrosia artemisiifolia* var. *elatior, Andropogon scoparius, Aster pilosus, Bouteloua curtipendula, Chrysanthemum leucanthemum* var. *pinnatifidum, Daucus carota, Festuca elatior, Lonicera maackii, Monarda fistulosa, Oenothera biennis, Setaria glauca*, and *Solidago canadensis.*
Comments on population size: Only a few plants were noted.
Information published elsewhere: No
Significance: New county record. Silver beard grass is native to the south and west of Illinois and adventive in waste ground in the state (Mohlenbrock 2002, Swink and Wilhelm 1994). Mohlenbrock (2002) records this plant from Alexander, Clark, Grundy, Jackson, Johnson, Sangamon and Union Counties in Illinois. Mohlenbrock (2001) reports this species from Sangamon, Grundy, Jackson, Johnson and Union Counties. Swink and Wilhelm (1994) cite this grass only from Grundy County in northeastern Illinois.
Species Native or Alien: Alien – native to the south and west of Illinois.

Scientific Name: *Anthriscus caucalis* M. Bieb.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Bur Chervil
Family: Umbelliferae (Apiaceae)
County: DuPage
Date of Collection: 11 June 2001
Collector's Name: Scott N. Kobal
Collection Number: 01-07
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152250
Locality information: Danada Forest Preserve
Habitat: The plants were found growing in a disturbed area that had been planted to prairie in 2000.
Associates: *Alliaria petiolata, Ambrosia artemisiifolia* var. *elatior, Capsella bursa-pastoris, Cerastium vulgatum, Chenopodium album, Daucus carota, Erigeron canadensis, Erechtites hieracifolia, Lactuca serriola, Lolium perenne, Oxalis stricta, Rorippa palustris* var. *fernaldiana, Rudbeckia hirta, Taraxacum officinale*, and *Veronica arvensis.*
Comments on population size: Small colony of plants observed
Information published elsewhere: Mohlenbrock (2002) makes mention of this record in Additonal Taxa (page 457).
Significance: New state record.
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Arabidopsis thaliana* (L.) Heynh.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Mouse-ear Cress
Family: Cruciferae (Brassicaceae)
County: DuPage
Date of Collection: 17 May 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 131199
Locality information: McDowell Grove Forest Preserve
Habitat: The plants were found growing in the wheel tracks on top of the Fawell Dam away from the turf grasses.
Associates: *Dactylis glomerata, Lychnis alba, Plantago lanceolata, Potentilla recta, Rumex crispus, Taraxacum officinale*, and *Veronica arvensis.*
Comments on population size: Small number of plants observed – habitat has now been destroyed.
Information published elsewhere: No
Significance: New county record. Mouse-ear cress is a European species that is occasional in the southern half of the state and rare in the northern half (Mohlenbrock 2002). Mohlenbrock and Ladd (1978) and Mohlenbrock (1980) report this species predominantly from southern Illinois, with Lake County being the only citation for northeastern Illinois. Swink and Wilhelm (1994) report this plant from Lake, Cook, Will, and Kankakee Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Aristida basiramea* Engelm.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Fork-Tipped Three-Awn Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 19 September 1994
Collector's Name: Wayne A. Lampa
Collection Number: 94-33B
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 123964
Locality information: West Chicago Prairie Forest Preserve
Habitat: Plants were found growing along the edge of the Chicago and Northwestern Railroad Yards.
Associates: *Ambrosia artemisiifolia* var. *elatior, Aster pilosus, Bidens polylepis, Bulbostylis capillaris, Cassia fasciculata*, and *Liatris pycnostachya.*
Comments on population size: Small number of plants observed.
Information published elsewhere: No
Significance: New county record. Swink and Wilhelm (1994) cite *Aristida basiramea* as being presumably introduced from farther west to the Chicago Region and reported it from Will, Grundy and Kankakee Counties. Mohlenbrock (2001) notes this species from 18 counties outside of the Chicago region.
Species Native or Alien: Alien – introduced from farther west.

Scientific Name: *Aristida intermedia* Scribn. & Ball
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: False Arrow Feather
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 19 September 1994
Collector's Name: Wayne A. Lampa
Collection Number: 93-33A
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 123174
Locality information: West Chicago Prairie Forest Preserve
Habitat: Plants were found growing along the edge of the Chicago and Northwestern Railroad Yards.
Associates: *Ambrosia artemisiifolia* var. *elatior, Aster pilosus, Bidens polylepis, Bulbostylis capillaris, Cassia fasciculata, and Liatris pycnostachya.*
Comments on population size: Small number of plants observed.
Information published elsewhere: No
Significance: New county record. *Aristida intermedia* has been noted previously from Lake, Cass, McHenry, Grundy, Henry, LaSalle, Will, and Lee Counties (Mohlenbrock and Ladd 1978, Mohlenbrock 2001). Swink and Wilhelm (1994) report this species from Lake, Will and Kankakee Counties in the Chicago region.
Species Native or Alien: Native

Scientific Name: *Aster exilis* Ell.
Identification Manual (Source of nomenclature): USDA, NRCS 2004
Common Name: Southern Annual Saltmarsh Aster
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 24 September 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-37
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155107
Locality information: West Branch Forest Preserve
Habitat: Along a portion of newly constructed shoreline of a quarry lake
Associates: *Bidens cernua* and *Echinochloa crusgalli.*
Comments on population size: Small – only a few plants noted
Information published elsewhere: No
Significance: New state record.
Species Native or Alien: Alien – introduced from farther south

Scientific Name: *Betula nigra* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: River Birch
Family: Betulaceae
County: DuPage
Date of Collection: 3 May 2001
Collector's Name: Scott N. Kobal
Collection Number: FPD 01-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152102
Locality information: McDowell Grove Forest Preserve
Habitat: Floodplain along West Branch of the DuPage River.
Associates: *Acer negundo, A. saccharinum, Actinomeris alternifolia, Alliaria petiolata, Asarum canadense, Anemone canadensis, Angelica atropurpurea, Cornus obliqua, Fraxinus pennsylvanica* var. *subintegerrima, Geum canadense, Impatiens capensis, Lonicera* X *muendeniensis, Phalaris arundinacea, Ranunculus abortivus, R. septentrionalis, Rhamnus cathartica, R. frangula, Ribes americanum, R. missouriense, Rosa multiflora, Urtica procera, Viburnum recognitum, Viola sororia,* and *Vitis riparia.*
Comments on population size: Two very large trees
Information published elsewhere: No
Significance: New county record. Although this species is widely planted in the county, this is the first record of native trees. River birch is a widely distributed tree in the eastern and midwestern United States (USDA, NRCS 2004). In Illinois, the species is more common in the southern part of the state, becoming less common northward (Mohlenbrock 2002). Both Mohlenbrock and Ladd (1978) and Swink and Wilhlem (1994) report the species from Kane, Will and Kankakee Counties in northeastern Illinois.
Species Native or Alien: Native

Scientific Name: *Betula pendula* Roth
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: European White Birch
Family: Betulaceae
County: DuPage
Date of Collection: 9 September 1998
Collector's Name: Scott N. Kobal
Collection Number: 98-28
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 141803
Locality information: Pratt's Wayne Woods Forest Preserve
Habitat: Tree was found growing in an old field that was rapidly becoming filled in with black cherry.
Associates: *Apocynum sibiricum, Aster pilosus, Cornus racemosa, Daucus carota, Lonicera* X *muendeniensis,*

Populus deltoides, Potentilla recta, Prunus serotina, Rhamnus frangula, Rubus allegheniensis, R. occidentalis, Solidago canadensis, and *Taraxacum officinale.*
Comments on population size: Only one tree noted
Information published elsewhere: No
Significance: New county record. *Betula pendula* is a commonly cultivated ornamental tree in DuPage County. The plant is reported from 17 states (including Illinois) primarily in the northeast and midwest (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) do not report this species for Illinois. Swink and Wilhelm (1994) and Mohlenbrock (2002) cite it from McHenry County in northeastern Illinois. In addition to DuPage County, this tree has also been recently collected in Kane and Will Counties (G. Wilhelm pers. comm.)
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Brassica napus* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Rutabaga
Family: Cruciferae (Brassicaceae)
County: DuPage
Date of Collection: 20 November 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-45
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 133738
Locality information: Collected along the Great Western Trail adjacent to the Timber Ridge Forest Preserve near West Chicago.
Habitat: The plants were found growing in a recently disturbed area on the Com ED right-of-way.
Associates: *Abutilon theophrasti, Avena sativa,* and *Setaria glauca*
Comments on population size: Large number of plants seen in 1996 – they did not persist.
Information published elsewhere: No
Significance: New county record. *Brassica napus* is a fairly widespread Eurasian species, occurring in 33 of the contiguous United States and Alaska (USDA, NRCS 2004). In Illinois, this plant is known from only seven counties in central and southern Illinois (Mohlenbrock and Ladd 1978, Mohlenbrock 1980). Swink and Wilhelm do not report this species from northeastern Illinois.
Species Native or Alien: Alien – introduced from Europe.

Scientific Name: *Carex eburnea* Boott
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Ivory Sedge
Family: Cyperaceae
County: DuPage
Date of Collection: 15 May 2003
Collector's Name: Scott N. Kobal and John Johnson
Collection Number: FPD 03-07
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155742
Locality information: Timber Ridge Forest Preserve
Habitat: Dry prairie
Associates: *Achillea millefolium, Aster ericoides, Cornus racemosa, Fragaria virginiana, Hieracium caespitosum, Poa pratensis, Solidago nemoralis, S. rigida, Trifolium pratense,* and *Viola sororia.*
Comments on population size: Small population of plants observed (15-20).
Information published elsewhere: No
Significance: New county record. *Carex eburnea* is a rare sedge found in wooded ravines and calcareous ledges primarily in the northern half of Illinois. Mohlenbrock (1999) and Swink and Wilhelm (1994) only cite this species from Cook and Lake Counties in northeastern Illinois.
Species Native or Alien: Native

Scientific Name: *Carex woodii* Dewey
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Wood's Stiff Sedge
Family: Cyperaceae
County: Kendall
Date of Collection: 12 May 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152106
Locality information: Collected at Maramech Woods Nature Preserve near Plano
Habitat: The plants were found growing in a northern flatwoods forest
Associates: *Alliaria petiolata, Asarum canadense, Carpinus caroliniana* var. *virginiana, Circaea lutetiana* var. *canadensis, Dentaria laciniata, Eupatorium rugosum, Galium concinnum, Geranium maculatum, Geum canadense, Isopyrum biternatum, Podophyllum peltatum, Polygonum virginianum, Ranunculus septentrionalis, Rosa multiflora, Smilax ecirrhata, Tilia americana,* and *Viburnum prunifolium.*
Comments on population size: Small population noted
Information published elsewhere: No
Significance: New county record – State Threatened Species (Illinois Endangered Species Protection Board 1999, Herkert and Ebinger 2002).
Species Native or Alien: Native

Scientific Name: *Cerastium brachypodum* (Engelm.)
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Short-Pedicelled Chickweed
Family: Caryophyllaceae
County: DuPage
Date of Collection: 24 May 2004
Collector's Name: Scott N. Kobal
Collection Number: FPD 04-05
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116898
Locality information: Collected at West Chicago Prairie Forest Preserve in West Chicago.
Habitat: The plants were growing near the Chicago and Northwestern Railroad yards in cinders.
Associates: *Ambrosia artemisiifolia* var. *elatior, Androsace occidentalis, Bromus tectorum, Draba reptans, Erigeron strigosus, Fragaria virginiana, Hypericum perforatum, Lepidium virginicum, Oxalis stricta, Rubus flagellaris, Rumex acetosella, Silene antirrhina, Specularia perfoliata, Tradescantia ohiensis,* and *Veronica arvensis.*
Comments on population size: Several dozen plants were noted.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Alien – apparently introduced from farther south.

Scientific Name: *Cerastium pumilum* Curtis
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Curtis's Mouse-ear Chickweed
Family: Caryophyllaceae
County: DuPage
Date of Collection: 17 May 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-04
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 131312
Locality information: McDowell Grove Forest Preserve
Habitat: Collected on the Fawell Dam south of McDowell Grove Forest Preserve in Naperville. Thousands of the plants were found growing in the wheel tracks on top of the dam away from the turf grasses in a sandy substrate.
Associates: *Achillea millefolium, Arabidopsis thaliana, Cichorium intybus, Dactylis glomerata, Erigeron annuus, Holosteum umbellatum, Plantago lanceolata, Potentilla recta, Rumex crispus, Taraxacum officinale, Trifolium pratense,* and *Veronica arvensis.*
Comments on population size: Very abundant at the time of collection – habitat has now been destroyed
Information published elsewhere: No
Significance: New county record. *Cerastium pumilum* is reported by Mohlenbrock and Ladd (1978) and Mohlenbrock (1986) as occurring only in Jackson County. Mohlenbrock (2002) notes that it is sparingly adventive to grassy areas and scattered in Illinois. Swink and Wilhelm (1994) cite this European species from McHenry, Kane, Grundy, Cook, Will, and Kankakee Counties.
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Ceratocephalus testiculatus* (Crantz) Roth
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Bur Buttercup
Family: Ranunculaceae
County: DuPage
Date of Collection: 14 April 1997
Collector's Name: Scott N. Kobal
Collection Number: 97-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 134836
Locality information: Blackwell Forest Preserve
Habitat: Limestone gravel pad in campground
Associates: *Cerastium vulgatum, Draba verna, Lonicera maackii, Poa annua, Rhamnus cathartica, Taraxacum officinale, Verbascum blattaria,* and *Veronica arvensis.*
Comments on population size: A few dozen plants noted
Information published elsewhere: No
Significance: New county record. Bur buttercup is known from 23 states, primarily in the western United States but extending as far eastward as New York (USDA, NRCS 2004). This Eurasian species is not cited by either Mohlenbrock and Ladd (1978) or Mohlenbrock (1986). Mohlenbrock (2002) notes that it is naturalized in waste areas, particularly campgrounds in the northeastern counties. Swink and Wilhelm (1994) report this plant from Lake, Grundy, Will and Kankakee Counties.
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Chenopodium ambrosioides* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: American Wormseed
Family: Chenopodiaceae
County: DuPage
Date of Collection: 11 October 2000
Collector's Name: Scott N. Kobal
Collection Number: FPD 00-11
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 149855
Locality information: Salt Creek Marsh Forest Preserve
Habitat: Growing along the east bank of Salt Creek approximately 1000 feet north of Route 19 (Irving Park

Road). Found in an area of Salt Creek that had recently undergone some shoreline stabilization.
Associates: *Acnida altissima, Ambrosia artemisiifolia* var. *elatior, Aster ontarionis, A. pilosus, Bidens comosa, Cryptotaenia canadensis, Echinochloa crusgalli, Eupatorium serotinum, Oxalis stricta, Phalaris arundinacea, Polygonum cespitosum* var. *longisetum, P. pensylvanicum, P. punctatum, Rudbeckia laciniata, Taraxacum officinale, Verbena hastata,* and *V. urticifolia.*
Comments on population size: Only a few plants noted
Information published elsewhere: No
Significance: New county record. Mexican tea is an introduction from tropical America that is very widespread in the United States (USDA, NRCS 2004) and Illinois (Mohlenbrock and Ladd 1978). Swink and Wilhelm (1994) record this species from Cook, Will, Grundy and Kane Counties.
Species Native or Alien: Alien – introduced from Tropical America.

Scientific Name: *Clematis terniflora* DC.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Sweet Autumn Clematis
Family: Ranunculaceae
County: DuPage
Date of Collection: 2 October 1996
Collector's Name: Scott N. Kobal and Wayne A. Lampa
Collection Number: 96-37
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 132745
Locality information: Collected at Wood Dale Grove Forest Preserve near Wood Dale.
Habitat: The plants were found growing near the shoulder of Wood Dale Road.
Associates: *Agropyron repens, Aster pilosus, Bidens frondosa, Carya ovata, Daucus carota, Melilotus alba, Rhamnus cathartica, Solanum carolinense, Solidago canadensis, Sonchus uliginosus, Trifolium pratense,* and *Vitis riparia.*
Comments on population size: Only a few plants noted.
Information published elsewhere: No
Significance: New county record. *Clematis terniflora* is a native of Japan that is commonly cultivated and often escaped (Gleason and Cronquist 1991). The species is known from 30 states in the contiguous United States, primarily in the east and midwest (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) report this species from eight counties, mainly in central and southern Illinois. The only northeastern Illinois report, for Kane County, is also cited by Swink and Wilhelm (1994).
Species Native or Alien: Alien – introduced from eastern Asia.

Scientific Name: *Cleome hassleriana* Jacq.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Spider Flower
Family: Capparidaceae
County: DuPage
Date of Collection: 2 August 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-29
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154766
Locality information: Collected at Salt Creek Marsh Forest Preserve near Itasca.
Habitat: Plants were growing in an open area along the shore of Salt Creek, south of Thorndale Ave.
Associates: *Acnida altissima, Asclepias incarnata, Bidens frondosa, Echinochloa crusgalli, Lindernia dubia, Phalaris arundinacea, Polygonum hydropiper, P. persicaria,* and *P. punctatum.*
Comments on population size: Only a few plants were noted.
Information published elsewhere: No
Significance: New county record. This tropical American species is commonly planted but rarely escapes from cultivation to waste areas in several parts of the state (Mohlenbrock 1980, 2002). Mohlenbrock (2002) cites this species from six counties in Illinois, with two (Kendall and Lake) being in the Chicago region. Swink and Wilhelm (1994) report spider flower from Kendall and Lake Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from Tropical America.

Scientific Name: *Coreopsis tinctoria* Nutt.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Golden Coreopsis
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 18 July 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-40
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127650
Locality information: Collected along the south shoulder of Hobson Road approximately 1/4 mile west of Route 53 near the Green Valley Forest Preserve
Habitat: Weedy road shoulder
Associates: *Atriplex patula hastata, Chenopodium glaucum, Cichorium intybus, Cirsium vulgare, Hordeum jubatum, Polygonum arenastrum, Sonchus uliginosus,* and *Taraxacum officinale.*
Comments on population size: A few plants noted.
Information published elsewhere: No

Significance: New county record. Golden coreopsis is considered to be adventive from the western United States and to have escaped from cultivation in Illinois (Mohlenbrock 2002, Swink and Wilhelm 1994). Mohlenbrock and Ladd (1978) and Swink and Wilhelm (1994) cited this species in five and six counties respectively in northeastern Illinois.
Species Native or Alien: Alien – introduced from farther west

Scientific Name: *Cosmos bipinnatus* Cav.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Common Cosmos
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 18 August 1998
Collector's Name: Scott N. Kobal
Collection Number: 98-24
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 141406
Locality information: Collected at Lincoln Marsh Forest Preserve near Wheaton.
Habitat: The plants were found growing along a trail near a tree stump.
Associates: *Ambrosia artemisiifolia* var. *elatior, Aster sagittifolius* var. *drummondii, Cornus racemosa, Crataegus mollis, Daucus carota, Erechtites hieracifolia, Fragaria virginiana, Geum canadense, Hackelia virginiana, Rosa multiflora,* and *Vitis riparia.*
Comments on population size: Approximately 12-15 plants noted.
Information published elsewhere: No
Significance: New county record. Common cosmos is a native of Mexico and is commonly cultivated as a garden flower and casually escaped (Gleason and Cronquist 1991). Mohlenbrock and Ladd (1978) report this species from Grundy, Jackson and Saline Counties; Mohlenbrock (2002) makes reference to Grundy, Jackson, Saline and Will counties. Swink and Wilhelm (1994) cite this species from Grundy and Will Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from Mexico.

Scientific Name: *Cotoneaster apiculatus* Rehd. & Wils.
Identification Manual (Source of nomenclature): Dirr 1998
Common Name: Cranberry Cotoneaster
Family: Rosaceae
County: DuPage
Date of Collection: 26 May 2004
Collector's Name: Scott N. Kobal
Collection Number: FPD 04-08
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116941
Locality information: Collected at the West Branch Forest Preserve near Bartlett.
Habitat: The plants were found growing in an old quarry area south of Army Trail Road on the dry mounds of clay and gravel. The area where the plants were found is located several hundred yards south of the Prestige Nursery, from where they presumably escaped.
Associates: *Apocynum sibericum, Asclepias verticillata, Cornus racemosa, Festuca elatior, Fragaria virginiana, Lonicera* X *muendeniensis, Melilotus officinalis, Rosa multiflora, Salix interior, Solidago canadensis, S. rigida,* and *Ulmus pumila.*
Comments on population size: Approximately 12 plants of various sizes were observed.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Alien – introduced from China.

Scientific Name: *Cucumis melo* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Muskmelon
Family: Cucurbitaceae
County: DuPage
Date of Collection: 25 July 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-18
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 132162
Locality information: Collected at Blackwell Forest Preserve near West Chicago.
Habitat: The plant was found growing on a mound of earth near a maintenance building.
Associates: *Ambrosia artemisiifolia* var. *elatior, Citrullus lanatus, Convolvulus arvensis, Digitaria ishaemum, Echinochloa crusgalli, Phytolacca americana, Poa compressa, Polygonum persicaria, Populus deltoides, Setaria viridis,* and *Xanthium strumarium.*
Comments on population size: Only one plant noted
Information published elsewhere: No
Significance: New county record. Neither Mohlenbrock and Ladd (1978) nor Mohlenbrock (1978, 1986) report muskmelon from Illinois. Mohlenbrock (2002) notes that it occasionally escapes from cultivation into waste ground. The species is widespread across the United States, occurring in 28 states (USDA, NRCS 2004). Swink and Wilhelm (1994) cite this species from McHenry, Grundy and Kankakee Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from the Old World.

Scientific Name: *Cucurbita pepo* L.
Identification Manual (Source of nomenclature): Mohlenbrock 1978
Common Name: Common Field Pumpkin
Family: Cucurbitaceae
County: Cook
Date of Collection: 1 August 1995
Collector's Name: Scott N. Kobal and Wayne A. Lampa
Collection Number: SK 95-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127542
Locality information: Collected in a dumpsite between the Des Plaines River and the Chicago Sanitary and Shipping Canal west of Route 83.
Habitat: Plants were found growing on a spoil pile
Associates: *Abutilon theophrasti, Acalypha rhomboidea, Ambrosia artemisiifolia* var. *elatior, Daucus carota, Digitaria ischaemum, Dipsacus laciniatus, Eragrostis pectinacea, Euphorbia maculata, Oxalis stricta, Polygonum arenastrum, P. scandens, Portulaca oleracea,* and *Solanum americanum.*
Comments on population size: Only a few plants were noted.
Information published elsewhere: No
Significance: New state record.
Species Native or Alien: Alien. Native to tropical America

Scientific Name: *Cucurbita pepo* L. var. *ovifera* (L.) Alef.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Pear Gourd
Family: Cucurbitaceae
County: DuPage
Date of Collection: 7 September 1999
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: 99-20
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 147016
Locality information: Collected at the West Branch Forest Preserve near Bartlett.
Habitat: Found growing in an area near a drainage tile that had been disturbed in the previous year.
Associates: *Abutilon theophrasti, Alliaria petiolata, Ambrosia trifida, Angelica atropurpurea, Arctium minus, Aster simplex, Cirsium arvense, Leonurus cardiaca, Nepeta cataria, Pastinaca sativa, Phalaris arundinacea, Polygonum pensylvanicum, P. persicaria, Setaria faberi, Solanum americanum, S. dulcamara, Solidago canadensis,* and *Teucrium canadense.*
Comments on population size: Only one large plant noted
Information published elsewhere: No
Significance: New county record. *Cucurbita pepo* var. *ovifera* is variety of the common field pumpkin (*Cucurbita pepo* L.) that is grown for the interesting and variable ornamental gourds it produces (Mohlenbrock 1978). Mohlenbrock and Ladd (1978) and Mohlenbrock (1978) report this tropical American species from seven counties in the southern half of Illinois. Swink and Wilhelm (1994) do not cite this species for northeastern Illinois.
Species Native or Alien: Alien; native of tropical America.

Scientific Name: *Dianthus barbatus* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Sweet William
Family: Caryophyllaceae
County: DuPage
Date of Collection: 3 June 1994
Collector's Name: Scott N. Kobal
Collection Number: 94-13
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 119353
Locality information: Pratt's Wayne Woods Forest Preserve
Habitat: Prairie/wetland restoration
Associates: *Baptisia leucantha, Chrysanthemum leucanthemum* var. *pinnatifidum, Coreopsis lanceolata, Melilotus alba, Monarda fistulosa, Petalostemum purpureum, Ratibida pinnata, Rudbeckia hirta, Solidago altissima, Trifolium hybridum,* and *T. pratense.*
Comments on population size: Approximately 20-30 plants seen – they have now disappeared.
Information published elsewhere: No
Significance: New county record. *Dianthus barbatus* is widely distributed in the United States, occurring in 35 of the contiguous 48 states (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) report the species from Jackson County; Mohlenbrock (2002) cites Jackson and McLean Counties. Swink and Wilhelm (1994) do not cite it for northeastern Illinois. This European garden plant is commonly cultivated as an ornamental and occasionally escapes (Gleason and Cronquist 1991).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Egeria densa* Planchon
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Brazilian Water Weed
Family: Hydrocharitaceae
County: DuPage
Date of Collection: 30 October 1996
Collector's Name: Scott N. Kobal, Wayne A. Lampa and Gerould Wilhelm
Collection Number: 96-44
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 133516

Locality information: West DuPage Woods Forest Preserve
Habitat: Small pond located near parking lot and picnic area.
Associates: *Potamogeton foliosus*
Comments on population size: Large number of plants observed in pond – was dominant aquatic species at time of collection.
Information published elsewhere: No
Significance: New county record – formerly known only from southern Illinois.
Species Native or Alien: Alien – native to southeastern Brazil and northern Argentina.

Scientific Name: *Epilobium parviflorum* Schreber.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Small-flowered Hairy Willow Herb
Family: Onagraceae
County: DuPage
Date of Collection: 5 August 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-10
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154769
Locality information: Collected in the Bur-Reed Marsh at the Morton Arboretum. Growing adjacent to the boardwalk (Main Trail Loop 2) at the northern end of the marsh.
Habitat: Marsh
Associates: *Agrostis alba, Ambrosia artemisiifolia* var. *elatior, Apocynum sibiricum, Aster simplex, Boehmeria cylindrica, Convolvulus sepium, Epilobium coloratum, Eupatorium perfoliatum, Juncus effusus, Lycopus americanus, Penthorum sedoides, Phalaris arundinacea, Prunella vulgaris* var. *lanceolata, Scirpus pendulus, Scutellaria lateriflora, Teucrium canadense, Verbena hastata,* and *V. urticifolia.*
Comments on population size: Only two plants were noted
Information published elsewhere: No
Significance: New state record. The plant was collected again in 2004 at the Hawk Hollow Forest Preserve in the northwestern portion of DuPage County.
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Erigeron divaricatus* Michx.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Dwarf Fleabane
Family: Compositae (Asteraceae)
County: Kendall
Date of Collection: 2 September 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-24
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152711
Locality information: Collected at Silver Springs State Park near Yorkville.
Habitat: The plants were found growing along a gravel path on the south side of Loon Lake.
Associates: *Ambrosia artemisiifolia* var. *elatior, Daucus carota, Digitaria ischaemum, Eragrostis pectinacea, Euphorbia supina, Medicago lupulina, Plantago rugelii, Taraxacum officinale,* and *Veronica arvensis.*
Comments on population size: Plants fairly abundant along pathway
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Eriochloa villosa* (Thunb.) Kunth
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Chinese Cup Grass
Family: Gramineae (Poaceae)
County: Kendall
Date of Collection: 2 September 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-25
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152695
Locality information: Collected at Silver Springs State Park near Yorkville.
Habitat: The plants were found growing along the edge of an interior road.
Associates: *Actinomeris alternifolia, Agropyron repens, Daucus carota, Echinochloa crusgalli, Phalaris arundinacea, Polygonum persicaria, P. scandens, Rubus occidentalis, Setaria faberi, S. glauca,* and *Solidago canadensis.*
Comments on population size: Small number of plants seen
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Erodium cicutarium* (L.) L'Hèr.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Storksbill
Family: Geraniaceae
County: Kendall
Date of Collection: 12 May 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL

Accession Number: 152105
Locality information: Collected at Maramech Woods Nature Preserve near Plano
Habitat: The plant was found growing in a recent prairie restoration near Griswold Springs Road and Fox River Drive.
Associates: *Ambrosia artemisiifolia* var. *elatior*, *A. trifida*, *Erigeron annuus*, *E. canadensis*, *Monarda fistulosa*, *Ratibida pinnata*, *Tanacetum vulgare*, *Taraxacum officinale*, and *Verbascum thapsus*.
Comments on population size: One plant seen
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Europe.

Scientific Name: *Euonymus alatus* (Thunb.) Siebold
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Burning Bush
Family: Celastraceae
County: Kendall
Date of Collection: 11 June 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-07
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152101
Locality information: Collected at Jay Woods Forest Preserve near Plano.
Habitat: The plants were found growing on a wooded bluff along the Little Rock Creek.
Associates: *Aesculus glabra*, *Alliaria petiolata*, *Arisaema triphyllum*, *Carya ovata*, *Cornus racemosa*, *Fraxinus pennsylvanica* var. *subintegerrima*, *Geranium maculatum*, *Prunus serotina*, *P. virginiana*, *Quercus alba*, *Rhus radicans*, *Smilacina racemosa* and *Tilia americana*.
Comments on population size: Small number of shrubs seen (15-20).
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Euonymus europaeus* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: European Spindle Tree
Family: Celastraceae
County: Kendall
Date of Collection: 27 May 2002
Collector's Name: Scott N. Kobal
Collection Number: SNK 02-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154753

Locality information: Cannonball Sedge Meadow near Yorkville.
Habitat: In a wooded floodplain along the edge of Blackberry Creek, east of Route 47 and north of Cannonball Trail.
Associates: *Acer negundo*, *Alliaria petiolata*, *Galium aparine*, *Lonicera maackii*, *Phalaris arundinacea*, *Rhus radicans*, *Rudbeckia laciniata*, *Sambucus canadensis*, *Solanum dulcamara*, *Solidago gigantea*, *Verbena urticifolia*, *Viburnum opulus*, and *Viola sororia*.
Comments on population size: One shrub observed
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Euonymus fortunei* (Turcz.) Hand.-Mazz.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Wintercreeper
Family: Celastraceae
County: Kendall
Date of Collection: 19 September 2004
Collector's Name: Scott N. Kobal
Collection Number: SNK 04-06
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116346
Locality information: Collected in the Old Post Park (Cook's Savanna). The plants were found growing near the intersection of Pearce Ford Drive and Waterford Drive near the Old Post Elementary School.
Habitat: Degraded oak woodland.
Associates: *Celtis occidentalis*, *Phytolacca americana*, *Polygonatum canaliculatum*, *Prunus serotina*, *Quercus alba*, *Ribes missouriense*, *Smilacina racemosa*, *Tilia americana*, *Ulmus americana*, and *Vitis riparia*.
Comments on population size: Numerous plants were noted in this woodland.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Alien – introduced from China.

Scientific Name: *Eupatorium sessilifolium* L. var. *brittonianum* Porter
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Upland Boneset
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 12 August 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-22
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 132164

Locality information: Collected at Waterfall Glen Forest Preserve near Darien.
Habitat: The plants were found growing on the west-facing slope of a small ravine in a white and black oak woodland.
Associates: *Agrimonia gryposepala, A. rostellata, Aristolochia serpentaria, Aster shortii, Cornus racemosa, Elymus villosus, Eupatorium purpureum, Phryma leptostachya, Poa compressa, Quercus alba, Q. velutina, Rosa setigera, Rhus radicans, Solidago ulmifolia, Viola sororia,* and *Vitis riparia.*
Comments on population size: Numerous plants were observed at the time of collection.
Information published elsewhere: No
Significance: New county record. Upland boneset is found in 20 states in the northeast and upper midwest (USDA, NRCS 2004). The plant is occasional in the southern half of Illinois and uncommon elsewhere (Mohlenbrock 2002). Both Mohlenbrock and Ladd (1978) and Swink and Wilhelm (1994) report this species from Cook and Will Counties in northeastern Illinois.
Species Native or Alien: Native

Scientific Name: *Euphorbia esula* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Leafy Spurge
Family: Euphorbiaceae
County: Kendall
Date of Collection: 6 May 2000
Collector's Name: Scott N. Kobal
Collection Number: SNK 00-04
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 148254
Locality information: Near Aurora along Route 30 approximately one mile south of Route 34. The plants were found growing along the east edge of the road.
Habitat: Road shoulder.
Associates: *Bromus inermis* and *Poa pratensis.*
Comments on population size: Small colony of plants noted – approximately 30.
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Eurasia.

Scientific Name: *Festuca capillata* Lam.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Hair-leaved Fescue
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 19 June 2003
Collector's Name: Scott N. Kobal
Collection Number: FPD 03-18
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155732
Locality information: Collected at Basic Life Forest Preserve, located east of Route 83 and north of Ogden Avenue. (Route 34).
Habitat: Numerous clumps of this grass were noted in a shrubby, disturbed prairie area along Route 83 near the Ogden Ave. on-ramp.
Associates: *Anemone virginiana, Asparagus officinalis, Chrysanthemum leucanthemum* var. *pinnatifidum, Cornus obliqua, C. racemosa, Daucus carota, Fragaria virginiana, Juniperus virginiana* var. *crebra, Lonicera* X *muendeniensis, Morus alba, Monarda fistulosa, Parthenium integrifolium, Poa compressa, Ratibida pinnata, Rhamnus cathartica, Solidago graminifolia, S. juncea,* and *Viburnum recognitum.*
Comments on population size: Plants were fairly abundant at the collection site.
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Festuca rubra* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Red Fescue
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 13 June 1994
Collector's Name: Scott N. Kobal and Wayne A. Lampa
Collection Number: 94-23
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 120900
Locality information: Hickory Grove Forest Preserve
Habitat: Found in an open wooded area that had been a former golf course.
Associates: *Agrostis alba, Aster sagittifolius* var. *drummondii, Aster simplex, Cirsium vulgare, Dactylis glomerata, Lonicera maackii, Phleum pratense, Quercus macrocarpa,* and *Solidago canadensis.*
Comments on population size: Large number of plants observed.
Information published elsewhere: No
Significance: New county record. Red fescue is native to Eurasia and is commonly planted in golf courses and to create low turfs in parks and other recreation areas (Swink and Wilhelm 1994). In the Chicago Region, Swink and Wilhelm (1994) report it from Cook and Lake Counties. This plant is also cited by Mohlenbrock and Ladd (1978), from the following Illinois counties: Peoria, Cass, Piatt, Jackson, and Alexander.
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Forsythia* X *intermedia* Zabel
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Golden Bell
Family: Oleaceae
County: DuPage
Date of Collection: 8 April 2004
Collector's Name: Scott N. Kobal
Collection Number: FPD 04-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116928
Locality information: Collected at West DuPage Woods Forest Preserve near West Chicago.
Habitat: The plants were found growing downslope from a former dwelling near the West Branch of the DuPage River. Several large colonies were noted with large and small plants present.
Associates: *Acer negundo, Alliaria petiolata, Geum canadense, Hepatica acutiloba, Juglans nigra, Lonicera maackii, Prunus serotina, Quercus rubra, Rhamnus cathartica, Ribes missouriense, Rosa multiflora, Tilia americana, Ulmus americana,* and *Viburnum opulus.*
Comments on population size: Numerous plants were noted in this woodland.
Information published elsewhere: No
Significance: New state record. Mohlenbrock (2002) cites only *Forsythia suspensa* (Thunb.) Vahl. as escaping from cultivation in Illinois. Swink and Wilhelm (1994) report *Forsythia* X *intermedia* as spontaneous only in Porter County, Indiana in the Chicago Region. They note that the two preceeding species, as well as *Forsythia viridissima* Lindl. are cultivated routinely in the region.
Species Native or Alien: Alien, introduced from cultivation.

Scientific Name: *Galium mollugo* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: White Bedstraw
Family: Rubiaceae
County: Kendall
Date of Collection: 16 June 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-09
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152084
Locality information: Collected at Maramech Woods Nature Preserve near Plano.
Habitat: The plants were found growing in a brome field near Griswold Springs Road and Fox River Drive.
Associates: *Bromus inermis, Carex brevior, Erigeron annuus, Juniperus virginiana crebra, Lactuca canadensis, Lonicera* X *muedeniensis, Pastinaca sativa,* and *Solidago canadensis.*
Comments on population size: Small number of plants observed
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Geum vernum* (Raf.) T. & G.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Spring Avens
Family: Rosaceae
County: Kendall
Date of Collection: 6 May 2000
Collector's Name: Scott N. Kobal
Collection Number: SNK 00-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 148255
Locality information: Collected at Harris Woods Forest Preserve.
Habitat: The plants were found along a mowed woodland path.
Associates: *Equisetum arvense, Erigeron philadelphicus, Eupatorium rugosum, Geum canadense, Helianthus grosseserratus, Taraxacum officinale,* and *Viola missouriensis.*
Comments on population size: A number of plants noted along trail
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Hamamelis virginiana* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Witch Hazel
Family: Hamamelidaceae
County: Kendall
Date of Collection: 4 May 2004
Collector's Name: Scott N. Kobal
Collection Number: SNK 04-03
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116932
Locality information: Collected at the Hoover Outdoor Education Center near Yorkville. The plants were found growing south of the Fox River, north of Fox Road, and west of Route 47.
Habitat: Wooded bluff along the Fox River.
Associates: *Alliaria petiolata, Anemone quinquefolia, Arabis laevigata, Carex penslyvanica, Carpinus caroliniana* var. *virginiana, Galium concinnum, Hepatica acutiloba, Ostrya virginiana, Polygonatum canalicualtum, Prenanthes alba, Prunus virginiana, Solidago flexicaulis,*

Thalictrum dioicum, Tilia americana, Trillium recurvatum, and *Viola sororia.*
Comments on population size: Numerous plants were noted in this woodland.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Native

Scientific Name: *Hedera helix* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: English Ivy
Family: Araliaceae
County: DuPage
Date of Collection: 12 December 2001
Collector's Name: Scott N. Kobal
Collection Number: FPD 01-26
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155191
Locality information: Warrenville Grove Forest Preserve in Warrenville.
Habitat: Along the floodplain of the West Branch of the DuPage River.
Associates: *Acer negundo, Alliaria petiolata, Fraxinus pennsylvanica, Glechoma hederacea, Hesperis matronalis, Lonicera maackii, L.* X *muendeniensis, Populus deltoides, Prunus serotina, Rhamnus cathartica, Ribes missouriense, Rosa multiflora, Ulmus americana,* and *Viburnum lantana.*
Comments on population size: Small number of vines seen – hard to distinguish individuals
Information published elsewhere: No
Significance: New county record. English ivy is known from 27 states in the contiguous United States (USDA, NRCS 2004). This plant is native of Europe and is widely cultivated in various forms and occasionally escapes (Gleason and Cronquist 1991). Mohlenbrock and Ladd (1978) and Mohlenbrock (2002) only report this species from Jackson County. Swink and Wilhelm (1994) do not list it for northeastern Illinois.
Species Native or Alien: Alien – native of Europe.

Scientific Name: *Heracleum mantegazzianum* Sommier & Levier
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Giant Hogweed
Family: Umbelliferae (Apiaceae)
County: DuPage
Date of Collection: 27 June 2001
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: FPD 01-11
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152083
Locality information: Collected at Waterfall Glen Forest Preserve near Darien.
Habitat: The plants were found growing along the bank of a branch of Sawmill Creek in a floodplain forest.
Associates: *Acer negundo, Actinomeris alternifolia, Ambrosia trifida, Amphicarpa bracteata, Aster lateriflorus, Crataegus punctata, Erigeron annuus, Eupatorium rugosum, Glyceria striata, Impatiens capensis, Phalaris arundinacea, Plantago rugelii, Polygonum virginianum, Ranunculus septentrionalis, Rudbeckia laciniata, Sambucus canadensis, Scirpus atrovirens, Solidago canadensis, Sphenopholis intermedia, Verbena urticifolia,* and *Vitis riparia.*
Comments on population size: Six to eight plants noted in 2001. Plants have been vigorously herbicided since that time to control population size.
Information published elsewhere: Mohlenbrock (2002) makes mention of this record in Additonal Taxa (page 457).
Significance: New state record
Species Native or Alien: Alien – introduced from southwest Asia.

Scientific Name: *Holosteum umbellatum* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Jagged Chickweed
Family: Caryophyllaceae
County: DuPage
Date of Collection: 17 May 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-03
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 131198
Locality information: Collected on the Fawell Dam south of the McDowell Grove Forest Preserve in Naperville.
Habitat: The plants were found growing in the wheel tracks on top of the dam away from the turf grasses.
Associates: *Achillea millefolium, Cichorium intybus, Plantago lanceolata, Poa pratensis, Potentilla recta, Taraxacum officinale,* and *Veronica arvensis.*
Comments on population size: Plants were fairly numerous at the time of collection–habitat has now been destroyed.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Alien–introduced from Eurasia.

Scientific Name: *Hypericum prolificum* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Shrubby St. John's Wort
Family: Hypericaceae
County: DuPage
Date of Collection: 18 July 2002

Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: FPD 02-08
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154763
Locality information: Collected at Timber Ridge Forest Preserve near Winfield.
Habitat: Found growing in a shrubby, disturbed prairie/old field near the edge of a marsh.
Associates: *Agrimonia gryposepala, Apocynum sibiricum, Asclepias verticillata, Aster ericoides, Carex granularis, Cornus racemosa, Crataegus monogyna, Daucus carota, Erigeron annuus, Lonicera* X *muendeniensis, Melilotus alba, Penstemon digitalis, Plantago lanceolata, Poa compressa, Poa pratensis, Prunella vulgaris* var. *lanceolata, Rhamnus cathartica, Rudbeckia triloba, Salix interior, Solidago rigida,* and *Trifolium pratense.*
Comments on population size: Two plants were noted in 2002
Information published elsewhere: No
Significance: New county record. Mohlenbrock and Ladd (1978) and Mohlenbrock (2002) cite shrubby St. John's Wort as occasional in the southern 3/5 of Illinois and also from Cook and Lake Counties in the Chicago region. Swink and Wilhelm (1994) record this plant from Cook, Lake and Kane Counties in northeastern Illinois.
Species Native or Alien: Native

Scientific Name: *Inula helenium* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Elecampane
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 7 October 2003
Collector's Name: Scott N. Kobal and Wayne A. Lampa
Collection Number: FPD 03-39
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155967
Locality information: Collected at the Basic Life Forest Preserve east of Route 83 and north of Ogden Ave (Route 34).
Habitat: The plant was found growing along the edge of a trail in a shrubby field.
Associates: *Acer negundo, Ambrosia artemisiifolia* var. *elatior, Arctium minus, Aster lateriflorus, Bidens frondosa, Daucus carota, Dipsacus laciniatus, Erigeron annuus, Glechoma hederacea, Helianthus grosseserratus, Polygonum cespitosum* var. *longisetum, Rhamnus cathartica, R. frangula, Rosa multiflora, Solidago canadensis* and *Vitis riparia.*
Comments on population size: Only one plant noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Iodanthus pinnatifidus* (Michx.) Steud.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Violet Cress
Family: Cruciferae (Brassicaceae)
County: Kendall
Date of Collection: 18 June 1999
Collector's Name: Scott N. Kobal and Jason Pettit
Collection Number: SNK 99-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 143869
Locality information: Collected at Baker's Woods Forest Preserve. The plants were found growing along the west bank of the Aux Sable Creek approximately 200 yards north of Route 52.
Habitat: Wooded floodplain.
Associates: *Asclepias syriaca, Campanula americana, Carex grisea, Cryptotaenia canadensis, Fraxinus pennsylvanica* var. *subintegerrima, Geum canadense, Gleditsia triacanthos, Lysimachia nummularia, Oxalis stricta, Poa compressa, Rhus radicans, Ulmus americana,* and *Vitis riparia.*
Comments on population size: Small number of plants seen
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Isoetes butleri* Engelm.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Glade Quillwort
Family: Isoetaceae
County: DuPage
Date of Collection: 27 May 1999
Collector's Name: Scott N. Kobal
Collection Number: 99-06
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 143903
Locality information: Waterfall Glen Forest Preserve
Habitat: Dolomite prairie – the plants occupied areas of the prairie that had bare soil and exposed rock with little competition from other flora.
Associates: *Allium canadense, A. cernuum, Cardamine parviflora* var. *arenicola, Carex crawei, C. molesta, C. tetanica, Deschampsia caespitosa* var. *glauca, Eleocharis compressa, Eupatorium serotinum, Hypericum sphaerocarpum, Isanthus brachiatus, Penstemon hirsutus, Poa compressa, Scutellaria parvula,* and *Veronica peregrina.*
Comments on population size: Only 12 to 15 individuals observed in 1999.
Information published elsewhere: No

Significance: New County record–State Endangered species (Illinois Endangered Species Protection Board 1999, Herkert and Ebinger 2002).
Species Native or Alien: Native

Scientific Name: *Lamium galeobdolon* (L.) L.
Identification Manual (Source of nomenclature): USDA, NRCS 2004
Common Name: Yellow Archangel
Family: Lamiaceae (Labiatae)
County: DuPage
Date of Collection: 10 May 1999
Collector's Name: Scott N. Kobal
Collection Number: 99-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 144004
Locality information: Collected at Wayne Grove Forest Preserve near Bartlett.
Habitat: The plants were found growing in an oak woodland approximately 1/2 mile north of Stearns Road and 1/2 mile west of Bartlett Road
Associates: *Alliaria petiolata, Allium canadense, Carya ovata, Circaea lutetiana* var. *candensis, Cornus racemosa, Erythronium albidum, Geum canadense, Hydrophyllum virginianum, Polygonatum canaliculatum, Polygonum virginianum, Prunus serotina, Ranunculus septentrionalis, Rhamnus cathartica, Ribes missouriense, Rubus occidentalis, Smilacina racemosa,* and *Viola sororia.*
Comments on population size: A few dozen plants noted in 1999 – subsequent visits to the site since that time indicate that the species is increasing in abundance.
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Lemna minuscula* Hertel
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Dinky Duckweed
Family: Lemnaceae
County: DuPage
Date of Collection: 27 June 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-26
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127656
Locality information: Waterfall Glen Forest Preserve
Habitat: Cattail marsh
Associates: *Ceratophyllum demersum, Cornus obliqua, Eleocharis erythropoda, Leersia oryzoides, Lycopus americanus, Rhamnus frangula, Typha* X *glauca* and *Vitis riparia.*
Comments on population size: Abundant in open water area of marsh.
Information published elsewhere: No
Significance: New county record. *Lemna minuscula* is reported from Carroll, Madison and Will Counties by Mohlenbrock (1970) and Mohlenbrock and Ladd (1978). In addition to these three counties, Mohlenbrock (2002) cites Cook County. Swink and Wilhelm (1994) cite dinky duckweed from Lake, Cook and Will Counties in the Chicago region. The small size and poor condition upon drying contribute to the problem of proper identification of this species (Mohlenbrock 1970).
Species Native or Alien: Native

Scientific Name: *Ligustrum obtusifolium* Siebold & Zucc.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Border Privet
Family: Oleaceae
County: DuPage
Date of Collection: 1 June 2000
Collector's Name: Scott N. Kobal
Collection Number: FPD 00-02
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 148868
Locality information: Collected at Oldfield Oaks Forest Preserve in Darien.
Habitat: The plant was found growing in a shrubby old field adjacent to a marsh.
Associates: *Acer negundo, Agrimonia gryposepala, Carex blanda, Chrysanthemum leucanthemum* var. *pinnatifidum, Cornus racemosa, Daucus carota, Erigeron annuus, Eupatorium altissimum, Galium mollugo, Geum canadense, Juglans nigra, Phalaris arundinacea, Potentilla recta, Prunus serotina, Rhamnus cathartica, Solidago canadensis, S. nemoralis,* and *Vitis riparia.*
Comments on population size: One shrub observed
Information published elsewhere: No
Significance: New county record. Border privet is a native of Japan that was first reported in Illinois by Mohlenbrock (1975), who stated that is rarely found in waste ground. This shrub is reported from 17 states in the eastern and midwestern United States (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) record this species only from Kane and Coles Counties. Ebinger (1983) noted many populations are found in disturbed sites in Illinois such as old fields, roadsides, disturbed areas and waste ground and stated this shrub has the potential to spread in natural areas. In northeastern Illinois, Swink and Wilhelm (1994) cite this species from Kane, Grundy and Kankakee Counties
Species Native or Alien: Alien – introduced from Asia.

Scientific Name: *Liriodendron tulipifera* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Tulip Tree
Family: Magnoliaceae
County: DuPage
Date of Collection: 25 May 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-08
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127547
Locality information: Collected at Waterfall Glen Forest Preserve near Darien.
Habitat: Oak woodland
Associates: *Acer negundo, Allium canadense, Allium cernuum, Alliaria petiolata, Lonicera* X *muendeniensis, Parthenocissus quinquefolia, Podophyllum peltatum, Prunus serotina, Quercus alba, Rhamnus cathartica, Rosa multiflora, Viburnum recognitum,* and *Vitis riparia.*
Comments on population size: Numerous large and small trees noted
Information published elsewhere: No
Significance: New county record. Tulip tree is usually found in rich, hardwood forests and confined to the southern three-fifths of the state (Mohlenbrock 2002). Mohlenbrock (1981) did not report this species in northeastern Illinois. Swink and Wilhelm (1994) report this tree from Kane, DeKalb and Will Counties in northeastern Illinois. They also report that it is probable that all of the northeastern Illinois collections represent escapes from cultivation.
Species Native or Alien: Alien – introduced from further south.

Scientific Name: *Lonicera subsessilis* Rehd.
Identification Manual (Source of nomenclature): Rehder 1940
Common Name: none
Family: Caprifoliaceae
County: DuPage
Date of Collection: 19 May 1997
Collector's Name: Victoria A. Nuzzo and Scott N. Kobal
Collection Number: 97-10
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 135632
Locality information: Collected at Fullersburg Woods Forest Preserve in Oak Brook.
Habitat: Found growing in a mesic woodland.
Associates: *Alliaria petiolata, Allium canadense, A. tricoccum* var. *burdickii, Arisaema triphyllum, Circaea lutetiana* var. *canadensis, Fraxinus americana, Parthenocissus quinquefolia, Polygonatum canaliculatum, Prunus serotina, Quercus alba, Ribes missouriense,* and *Viburnum opulus.*
Comments on population size: One shrub was observed
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – native of Korea

Scientific Name: *Lupinus polyphyllus* Lindl.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Bigleaf Lupine
Family: Leguminosae (Fabaceae)
County: DuPage
Date of Collection: 3 June 1994
Collector's Name: Scott N. Kobal
Collection Number: 94-19
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 120781
Locality information: Pratt's Wayne Woods Forest Preserve
Habitat: Prairie Restoration
Associates: *Chrysanthemum leucanthemum* var. *pinnatifidum, Coreopsis lanceolata, Daucus carota, Monarda fistulosa, Poa pratensis, Ratibida pinnata, Rudbeckia hirta,* and *Taraxacum officinale.*
Comments on population size: Approximately 10-15 plants noted
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from the western United States.

Scientific Name: *Lycopus europaeus* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: European Water Horehound
Family: Labiatae (Lamiaceae)
County: DuPage
Date of Collection: 29 July 1999
Collector's Name: Scott N. Kobal
Collection Number: 99-16
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 144027
Locality information: Collected at Waterfall Glen Forest Preserve near Lemont
Habitat: The plants were found growing along the edge of a cattail marsh that was south of the Des Plaines River and north of the Chicago Sanitary and Shipping Canal.
Associates: *Acer saccharinum, Bidens comosa, Boehmeria cylindrica, Impatiens capensis, Iris pseudacorus, Lemna minor, Phalaris arundinacea, Rumex altissimus, Sagittaria latifolia, Salix interior, Solanum dulcamara,* and *Typha* X *glauca.*
Comments on population size: Small number of plants noted

Information published elsewhere: No
Significance: New county record. *Lycopus europaeus* is a European species that is reported from 17 states in the east and Midwest (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) and Mohlenbrock (2002) report this species from McHenry County. Swink and Wilhelm (1994) cite this plant from McHenry, Kane and Kendall Counties in northeastern Illinois.
Species Native or Alien: Alien–introduced from Europe

Scientific Name: *Lysimachia vulgaris* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Garden Loosestrife
Family: Primulaceae
County: DuPage
Date of Collection: 4 September 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-32
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 132776
Locality information: Collected at Swift Prairie Forest Preserve near Addison.
Habitat: The plants were found growing in a prairie restoration area.
Associates: *Ambrosia artemisiifolia* var. *elatior, Aster pilosus, A. novae-angliae, Bidens frondosa, Convolvulus sepium, Coreopsis tinctoria, Echinochloa crusgalli, Hibiscus trionum, Melilotus alba,* and *Plantago rugelii.*
Comments on population size: Only a few plants noted
Information published elsewhere: No
Significance: New county record. This native of Eurasia is found occasionally escaping from cultivation, usually into moist fields (Mohlenbrock 2002, Gleason and Cronquist 1991). Mohlenbrock and Ladd (1978) report this species from 10 counties in Illinois, five of those being in northeastern Illinois. Swink and Wilhelm (1994) cite the same five counties: Lake, Kane, Kendall, Cook and Will.
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Magnolia stellata* (Sieb. & Zucc.) Maxim.
Identification Manual (Source of nomenclature): USDA, NRCS 2004
Common Name: Star Magnolia
Family: Magnoliaceae
County: DuPage
Date of Collection: 2 November 1994
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: 94-38
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 123181
Locality information: Collected at Herrick Lake Forest Preserve near Wheaton.
Habitat: The plant grew in an old field that is becoming dominated by trees and shrubs
Associates: *Agrimonia gryposepala, Aster sagittifolius* var. *drummonii, Lonicera maackii, L.* X *muendeniensis, Poa compressa, Rhamnus cathartica, R. frangula, Sanicula gregaria,* and *Viburnum recognitum.*
Comments on population size: Only one individual observed
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Melissa officinalis* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Common Balm
Family: Labiatae (Lamiaceae)
County: DuPage
Date of Collection: 3 September 2003
Collector's Name: Scott N. Kobal
Collection Number: FPD 03-33
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155943
Locality information: Collected at Blackwell Forest Preserve near Warrenville.
Habitat: The plants were found growing along the edge of a woodland trail near Springbrook Creek, south of Mack Road.
Associates: *Acer negundo, Alliaria petiolata, Arctium minus, Circaea lutetiana* var. *canadensis, Dactylis glomerata, Geum canadense, Oxalis europea, Parthenocissus quinquefolia, Quercus alba, Q. macropcarpa, Rhamnus cathartica, Taraxacum officinale,* and *Viburnum opulus.*
Comments on population size: Only one plant was noted. One plant was also found and collected in a degraded oak woodland at Maple Grove Forest Preserve in October 2004.
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Monarda didyma* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Oswego Tea
Family: Labiatae (Lamiaceae)
County: DuPage
Date of Collection: 10 July 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-07
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL

Accession Number: 154762
Locality information: Collected at Wayne Grove Forest Preserve near Bartlett
Habitat: The plants were found growing in an oak woodland where they had presumably escaped from nearby residences.
Associates: *Agrimonia gryposepala, Amphicarpaea bracteata, Arisaema triphyllum, Aster lateriflorus, Carya ovata, Circaea lutetiana canadensis, Dioscorea villosa, Eupatorium rugosum, Fraxinus americana, Galium triflorum, Impatiens capensis, Lamium galeobdolon, Leersia virginica, Parthenocissus quinquefolia, Phalaris arundinacea, Polygonum virginianum, Prunus serotina, Quercus alba, Rubus occidentalis, Smilacina racemosa,* and *Smilax ecirrhata.*
Comments on population size: Approximately 6-8 plants seen
Information published elsewhere: No
Significance: New county record. Oswego Tea, a native of the eastern United States and widely cultivated as an ornamental, has escaped from cultivation into woodlands in Illinois (Mohlenbrock 2002, Swink and Wilhelm 1994). Mohlenbrock (2002) cites this species from Cook, Hancock, Lake, McDonough, Shelby and Wasbash Counties in Illinois. Swink and Wilhelm (1994) record Oswego tea from Cook and Lake Counties in the Chicago region.
Species Native or Alien: Alien – native to the eastern United States

Scientific Name: *Myriophyllum spicatum* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: European Water Milfoil
Family: Haloragidaceae
County: DuPage
Date of Collection: 27 July 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-44
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127657
Locality information: East Branch Forest Preserve
Habitat: Quarry Lake
Associates: No aquatic associates were noted.
Comments on population size: Very abundant at the time of collection– herbicide control has kept the population down in recent years.
Information published elsewhere: No
Significance: New county record. European water milfoil, a native of Europe, was not reported from Illinois by Mohlenbrock and Ladd (1978), or Mohlenbrock (1986). Swink and Wilhelm (1994) cite the species from Lake, McHenry and Kendall Counties in northeastern Illinois. Mohlenbrock (2002) reports the plant from those counties cited by Swink and Wilhelm (1994). Based on specimens at the Morton Arboretum, *Myriophyllum spicatum* has been collected recently from Kane, Grundy and DeKalb Counties in the Chicago region since 1994 (G. Wilhelm, pers. comm.).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Najas marina* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Spiny Naiad
Family: Najadaceae
County: DuPage
Date of Collection: 1 October 1997
Collector's Name: Scott N. Kobal
Collection Number: 97-26
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 136646
Locality information: Pratt's Wayne Woods Forest Preserve
Habitat: Quarry pond
Associates: *Najas minor* and *Potamogeton nodosus*
Comments on population size: Small number of plants observed
Information published elsewhere: No
Significance: New county record. *Najas marina* was first collected in Illinois in Lake County in 1964 (Winterringer 1966). Mohlenbrock and Ladd (1978) and Mohlenbrock (2002) both cite this Eurasian species as occurring only in Lake County. Swink and Wilhelm (1994) report spiny naiad from Lake and McHenry Counties. *Najas marina* is found in brackish or highly alkaline water of ponds and lakes (Gleason and Cronquist 1991).
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Najas minor* All.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Brittle Naiad
Family: Najadaceae
County: DuPage
Date of Collection: 1 October 1997
Collector's Name: Scott N. Kobal
Collection Number: 97-27
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 136648
Locality information: Pratt's Wayne Woods Forest Preserve
Habitat: Quarry Pond
Associates: *Najas marina* and *Potamogeton nodosus*
Comments on population size: Quite abundant in the shallow areas of the pond. Since its discovery in 1997, it has been found in eight additional forest preserves in lakes and wetland restoration sites.

Information published elsewhere: No
Significance: New county record – formerly known only from the southern 2/3 of Illinois.
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Narcissus pseudonarcissus* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Daffodil
Family: Amaryllidaceae
County: DuPage
Date of Collection: 15 April 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154754
Locality information: Salt Creek Marsh Forest Preserve
Habitat: Plants were found growing on a spoil pile of soil and concrete.
Associates: *Acer negundo, Alliaria petiolata, Geum canadense, Lonicera* X *muendeniensis, Prunus serotina, Rhamnus cathartica, Rosa multiflora, Taraxacum officinale, Ulmus pumila,* and *Vitis riparia.*
Comments on population size: A few plants noted growing on the spoil pile.
Information published elsewhere: No
Significance: New county record. This commonly planted species native to Europe occasionally escapes from cultivation into waste places or persists in areas where it was formerly planted (Gleason and Cronquist 1991, Swink and Wilhelm 1994). Mohlenbrock and Ladd (1978) cite this species from 14 counties in Illinois, with Cook County being the only record for the Chicago region. Swink and Wilhelm (1994) record this plant only from Cook and Lake Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from Europe.

Scientific Name: *Oenothera macrocarpa* Nutt.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Winged Fruit Evening Primrose
Family: Onagraceae
County: DuPage
Date of Collection: 23 June 1994
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: 94-18
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 120749
Locality information: Collected at Glen Oak Forest Preserve in Glen Ellyn
Habitat: Prairie Restoration
Associates: *Ambrosia artemisiifolia* var. *elatior, Aster pilosus, Cirsium arvense, Convolvulus arvensis, Daucus carota, Erigeron annuus, Lactuca scariola, Oenothera biennis, Phleum pratense, Rudbeckia hirta, Silphium integrifolium,* and *Trifolium repens.*
Comments on population size: Only a few plants seen – the species was seen at one other prairie/wetland restoration area in 1998.
Information published elsewhere: No
Significance: New county record. *Oenothera macrocarpa* is reported from eight states in the midwestern United States (USDA, NRCS 2004). This plant is cited in Illinois only from St. Clair County (Mohlenbrock and Ladd 1978, Mohlenbrock 2002). Swink and Wilhelm (1994) do not record this plant for the Chicago region.
Species Native or Alien: Alien – introduced from farther west

Scientific Name: *Oenothera perennis* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Small Sundrops
Family: Onagraceae
County: DuPage
Date of Collection: 26 June 2003
Collector's Name: Scott N. Kobal
Collection Number: FPD 03-22
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155730
Locality information: Collected at Fischer Woods Forest Preserve near Bensenville.
Habitat: The plants were found growing in a small opening of a moist, shrubby area
Associates: *Agrimonia gryposepala, Anemone virginiana, Fraxinus pennsylvanica, Gentiana andrewsii, Helianthus grosseserratus, Hypericum punctatum, Prunella vulgaris lanceolata, Rhamnus cathartica, Rhus radicans,* and *Solidago canadensis.*
Comments on population size: A few small clumps noted
Information published elsewhere: No
Significance: New county record. State threatened species (Illinois Endangered Species Protection Board 1999, Herkert and Ebinger 2002).
Species Native or Alien: Native

Scientific Name: *Oryzopsis racemosa* (Sm.) Hitchc.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Black-seeded Rice Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 7 July 1998
Collector's Name: Scott N. Kobal
Collection Number: 98-17
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL

Accession Number: 141108
Locality information: Blackwell Forest Preserve
Habitat: Southwest-facing slope on wooded glacial kame
Associates: *Alliaria petiolata, Arctium minus, Campanula americana, Circaea lutetiana* var. *canadensis, Elymus villosus, Geranium maculatum, Geum canadense, Hackelia virginiana, Hesperis matronalis, Leonurus cardiaca, Lonicera maackii, Phlox divaricata, Ribes missouriense, Rubus allegheniensis, Rubus occidentalis, Sanicula gregaria, Smilacina racemosa, Smilax lasioneura,* and *Uvularia grandiflora.*
Comments on population size: Only one small clump observed in 1998 – the population has since increased.
Information published elsewhere: No
Significance: New county record. This rare grass has been reported from Grundy, LaSalle, Winnebago, Peoria, and Vermillion Counties by Mohlenbrock and Ladd (1978). Swink and Wilhelm (1994) report this plant from Grundy, Kane, Lake and Cook Counties in northeastern Illinois.
Species Native or Alien: Native

Scientific Name: *Panicum gattingeri* Nash
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Gattinger's Panic Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 17 September 1999
Collector's Name: Scott N. Kobal
Collection Number: 99-22
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 145346
Locality information: Waterfall Glen Forest Preserve
Habitat: The plants were found growing along a little used gravel access road.
Associates: *Agalinis tenuifolia, Ambrosia artemisiifolia* var. *elatior, Aster ericoides, Campanula aparinoides, Convolvulus sepium, Daucus carota, Eragrostis pectinacea, Euphorbia supina, Gaura biennis* var. *pitcheri, Lobelia siphilitica, Lycopus americanus, Oenothera biennis, Panicum capillare, Poa compressa, Populus deltoides, Prunella vulgaris* var. *lanceolata, Solidago canadensis, Sporobolus neglectus,* and *Typha* X *glauca.*
Comments on population size: Only a small number of plants were observed.
Information published elsewhere: No
Significance: New county record. *Panicum gattingeri* is a rare weed of dry ruderal areas, scattered throughout the state, except for the northern three tiers of counties (Mohlenbrock 1986, Swink and Wilhelm 1994). Mohelnbrock and Ladd (1978), Swink and Wilhelm (1994), and Mohlenbrock (2001) cite this grass from only Kankakee County in northeastern Illinois. This species is sometimes considered to be a variety of *Panicum capillare* L. by some botanists, others consider it to be synonymous with *P. philadelphicum* Trin. (Mohlenbrock 2001).
Species Native or Alien: Native

Scientific Name*: Panicum latifolium* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Broad-leaved Panic Grass
Family: Gramineae (Poaceae)
County: Kendall
Date of Collection: 4 August 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-12
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152093
Locality information: Collected at Maramech Woods Nature Preserve near Plano.
Habitat: The plants were found growing on a wooded slope.
Associates: *Campanula americana, Carex pensylvanica, Eupatorium rugosum, Festuca obtusa, Galium concinnum, Parthenocissus quinquefolia, Phryma leptostachya, Prunus serotina, Quercus rubra, Ulmus americana, Viburnum prunifolium, Viola sororia,* and *Xanthoxylum americanum.*
Comments on population size: Small population observed
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Panicum philadelphicum* Trin.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Philadelphia Panic Grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 24 September 2002
Collector's Name: Scott N. Kobal and Wayne A. Lampa
Collection Number: FPD 02-26
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154934
Locality information: West Branch Forest Preserve
Habitat: Old former quarry area on a clay and gravel substrate.
Associates: *Agalinis tenuifolia, Ambrosia artemisiifolia* var. *elatior, Aster pilosus, A. novae-angliae, Bidens cernua, Carex granularis, Cornus racemosa, Digitaria ischaemum, Juncus dudleyi, J. nodosus, J. torreyi, Lycopus americanus, Oenothera biennis, Panicum capillare, P. implicatum, Prunella vulgaris* var. *lanceolata, Scirpus pendulus, Solidago graminifolia, Sporobolus vaginiflorus,* and *Xanthium strumarium.*

Comments on population size: Large number of plants were observed (50+).
Information published elsewhere: No
Significance: New county record. *Panicum philadelphicum* is locally scattered in the southern 3/5 of the state as well as DeKalb County in northeastern Illinois (Mohlenbrock and Ladd 1978, Mohlenbrock 1986, Swink and Wilhelm 1994, Mohlenbrock 2001). Mohlenbrock (2001, 2002) describes the habitat of this plant as being dry, usually sandy soil. Swink and Wilhelm (1994) report that it is a species of limestone pavements and outcrops, but have not seen any specimens from the Chicago region.
Species Native or Alien: Native

Scientific Name: *Papaver rhoeas* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Corn Poppy
Family: Papaveraceae
County: DuPage
Date of Collection: 24 June 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-09
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 131539
Locality information: Winfield Mounds Forest Preserve near Winfield.
Habitat: In an old field south of Geneva Road.
Associates: *Abutilon theophrasti, Acer negundo, Ambrosia artemisiifolia* var. *elatior, Arctium minus, Brassica kaber, Chenopodium album, Cirsium vulgare, Convolvulus arvensis, Erigeron canadensis, Festuca elatior,* and *Hibiscus trionum.*
Comments on population size: Only one plant seen
Information published elsewhere: No
Significance: New county record. *Papaver rhoeas* is a widely distributed plant, occurring in 35 of the contiguous United States (USDA, NRCS 2004). Corn poppy is a native of Eurasia that occasionally escapes from cultivation but is non-persistent (Mohlenbrock 2002, Swink and Wilhelm 1994). This species is reported from 11 counties in Illinois by Mohlenbrock and Ladd (1978), of which two (Cook and Will) are located in northeastern Illinois. Swink and Wilhelm (1994) record this species from Cook County based on a record from Jones and Fuller (1955).
Species Native or Alien: Alien; introduced from the Old World

Scientific Name: *Parthenocissus tricuspidata* (Siebold & Zucc.) Planch.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Boston Ivy
Family: Vitaceae
County: DuPage
Date of Collection: 27 October 1998
Collector's Name: Scott N. Kobal
Collection Number: 98-32
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 142227
Locality information: Waterfall Glen Forest Preserve
Habitat: In a plantation of jack pine, spreading along the ground and climbing up the trunks of the pine trees.
Associates: In a plantation of *Pinus banksiana*, with *Acer negundo, Alliaria petiolata, Celastrus orbiculatus, Cirsium arvense, Polygonum virginianum, Ribes missouriense, Rubus allegheniensis, R. occidentalis, Ulmus americana,* and *Vitis riparia.*
Comments on population size: Plants were growing in a rather confined area (10 x 10 meters).
Information published elsewhere: No
Significance: New county record. Boston Ivy is native to China and Japan and is commonly planted as a wall climber and rarely escaping (Gleason and Cronquist 1991, Swink and Wilhelm 1994). Mohlenbrock and Ladd (1978) report this species only from Kane and Hancock Counties; Swink and Wilhelm (1994) cite Kane, Cook and Will Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Petunia parviflora* A.L. Juss.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Seaside petunia
Family: Solanaceae
County: DuPage
Date of Collection: 7 October 2003
Collector's Name: Scott N. Kobal
Collection Number: FPD 03-40
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 156037
Locality information: Collected at the Salt Creek Greenway Forest Preserve near Oak Brook
Habitat: The small mat-forming plants were found growing very abundantly along the east shoreline of Salt Creek north of 22nd Street.
Associates: *Acnida altissima, Aster simplex, A. subulatus, Bidens comosa, Chenopodium glaucum, Cyperus esculentus, Glechoma hederacea, Lippa lanceolata, Lycopersicum esculentum, Polgonum arenastrum, P. hydropiper, P. pensylvanicum, P. persicaria, P. punctatum, Populus deltoides, Viola sororia,* and *Xanthium strumarium.*
Comments on population size: Large population; hundreds of plants noted
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – mainly subtropical in both North and South Amercia.

Scientific Name: *Philadelphus pubescens* Loisel.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Downy Mock Orange
Family: Saxifragaceae
County: DuPage
Date of Collection: 13 June 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-18
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127553
Locality information: Collected at Hidden Lake Forest Preserve south of Glen Ellyn.
Habitat: The plant was found along the edge of a small ravine in an oak woodland.
Associates: *Acer negundo, Alliaria petiolata, Geum canadense, Hemerocallis fulva, Lonicera maackii, Parthenocissus quinquefolia, Prunus serotina, Prunus virginiana, Quercus alba, Rhamnus cathartica,* and *Rhus radicans.*
Comments on population size: A few shrubs noted.
Information published elsewhere: No
Significance: New county record. Downy mock orange is known from 20 states in the east and midwest (USDA, NRCS 2004). Mohlenbrock (2002) reports that the species is native to the southern United States and rarely escapes – citing it from Cook and Madison Counties. Swink and Wilhelm (1994) cite this species from Cook County and consider it adventive to the Chicago region.
Species Native or Alien: Alien; introduced from farther south.

Scientific Name: *Pinus nigra* Arnold
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Austrian Pine
Family: Pinaceae
County: DuPage
Date of Collection: 26 May 2004
Collector's Name: Scott N. Kobal
Collection Number: FPD 04-06
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116935
Locality information: Collected at Herrick Lake Forest Preserve near Warrenville. The plants were found growing in a shrubby area adjacent to the St. James Farm, south of Butterfield Road (Route 56) and west of Herrick Road.
Habitat: The tree, approximately 1.5 meters tall, was found in a thicket about 100—150 feet from a row of large Austrian pines planted on the St. James Farm property. There was also a row of honey locusts adjacent to the pines and these were also seen escaped in the area.
Associates *Aster sagittifolius* var. *drummondii, Carex blanda, Convolvulus sepium, Gleditsia triacanthos, Morus alba, Poa pratensis, Rhamnus cathartica, Rosa multiflora, Rubus occidentalis, Solidago canadensis,* and *Vitis riparia.*
Comments on population size: One individual was noted.
Information published elsewhere: No
Significance: New county record.
Species Native or Alien: Alien – introduced from Europe.

Scientific Name: *Polygonum bungeanum* Turcz.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Prickly Smartweed
Family: Polygonaceae
County: Will
Date of Collection: 4 October 1998
Collector's Name: Scott N. Kobal
Collection Number: SNK 98-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 141974
Locality information: Collected at the Lenore McDonald Farm (Conservation Foundation Property) in Naperville. The area is located north of Knoch Knolls Road and west of Ring Road.
Habitat: The plants were found growing along the edge of a cornfield.
Associates: *Abutilon theophrasti, Acalypha rhomboidea, Agropyron repens, Chenopodium album, Cirsium arvense, Glechoma hederacea, Phleum pratense, Plantago major, Polygonum persicaria, Rumex crispus, Setaria faberi, Solanum americanum,* and *Trifolium repens.*
Comments on population size: Only a small number of plants noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Polygonum cespitosum* Blume var. *longisetum* (Bruyn) Stewart
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Creeping Smartweed
Family: Polygonaceae
County: Kendall
Date of Collection: 6 August 2000
Collector's Name: Scott N. Kobal
Collection Number: SNK 00-09
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 149849
Locality information: Collected at Harris Woods Forest Preserve.
Habitat: The plants were found along a woodland path.
Associates: *Acer saccharum, Aster lateriflorus, Carex jamesii, Geum canadense, Prunus virginiana, Rhus radicans, Rubus occidentalis,* and *Smilacina racemosa.*

Comments on population size: Approximately 20–30 plants noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Polygonum cespitosum* Blume var. *longisetum* (Bruyn) Stewart
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Creeping Smartweed
Family: Polygonaceae
County: Kane
Date of Collection: 3 September 2002
Collector's Name: Scott N. Kobal
Collection Number: SNK 02-10
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155042
Locality information: Collected at Tri-County State Park in the Kane County portion.
Habitat: The plants were found growing in a disturbed wooded area that was recently cleared of brushy understory.
Associates: *Acer negundo, Alliaria petiolata, Aster lateriflorus, Bidens frondosa, Hackelia virginiana, Parthenocissus quinquefolia, Phytolacca americana, Prunus serotina, Rhamnus cathartica, Rhus radicans, Solanum americanum, S. dulcamara, Taraxacum officinale, Ulmus pumila,* and *Vitis riparia.*
Comments on population size: Plants fairly abundant
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Potamogeton illinoensis* Morong
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Illinois Pondweed
Family: Zosteraceae
County: DuPage
Date of Collection: 22 November 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-35
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155108
Locality information: Hidden Lake Forest Preserve
Habitat: Constructed lake, adjacent to the East Branch of the DuPage River.
Associates: No aquatic associates were noted at the time of this collection.
Comments on population size: Plants were fairly abundant in certain areas of the lake.
Information published elsewhere: No
Significance: New county record. Illinois pondweed is reported as occasional in lakes, and often found in calcareous waters (Swink and Wilhelm 1994). This plant is cited from the following counties in northeastern Illinois by Swink and Wilhelm (1994): McHenry, Lake, Cook, Kendall and Kankakee.
Species Native or Alien: Native

Scientific Name: *Potamogeton zosteriformis* Fern.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Flat-stemmed Pondweed
Family: Zosteraceae
County: DuPage
Date of Collection: 9 July 2001
Collector's Name: Scott N. Kobal
Collection Number: 01-13
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152099
Locality information: Springbrook Prairie Forest Preserve
Habitat: Constructed wetland
Associates: *Najas minor, Potamogeton crispus* and *Potamogeton nodosus.*
Comments on population size: Small number of plants observed.
Information published elsewhere: No
Significance: New county record. *Potamogeton zosteriformis* is reported from Kankakee, Cook, Lake, McHenry, Winnebago and Menard Counties by Mohlenbrock and Ladd (1978). Swink and Wilhelm (1994) add Kane County to this list and report that it is frequent in lakes and streams, rare in the western sector of the Chicago region with most contemporary populations persisting only in the better lakes of our eastern sector.
Species Native or Alien: Native

Scientific Name: *Potentilla intermedia* L.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Intermediate Cinquefoil
Family: Rosaceae
County: DuPage
Date of Collection: 23 June 1994
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: 94-26
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 120893
Locality information: Collected at Glen Oak Forest Preserve in Glen Ellyn.
Habitat: The plants grew in a prairie restoration.
Associates: *Aster pilosus, Convolvulus sepium, Daucus carota, Echinacea purpurea, Elymus canadensis, Erigeron*

annuus, Phleum pratense, Ratibida pinnata, and *Rudbeckia hirta.*
Comments on population size: Only a few plants noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Prunus avium* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Sweet Cherry
Family: Rosaceae
County: DuPage
Date of Collection: 29 April 1997
Collector's Name: Scott N. Kobal
Collection Number: 97-03
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 135640
Locality information: Collected at West DuPage Woods Forest Preserve near West Chicago.
Habitat: Found growing in a wooded area at the edge of a picnic area.
Associates: *Agrimonia gryposepala, Alliaria petiolata, Galium triflorum, Geum canadense, Polygonum virginianum, Prunus serotina, Quercus velutina, Rhamnus cathartica, Rubus occidentalis, Smilacina racemosa,* and *Taraxacum officinale.*
Comments on population size: One tree noted
Information published elsewhere: No
Significance: New county record. Sweet cherry is known from 26 states in the northeast, midwest and western United States (USDA, NRCS 2004). This native of Eurasia is cited by Gleason and Cronquist (1991) as often escaping from cultivation in our range, even appearing like a native. Mohlenbrock (2002) notes that this species rarely escapes from cultivation. Mohlenbrock and Ladd (1978) cited it from Jackson County in Illinois. Swink and Wilhelm (1994) do not report it from northeastern Illinois.
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Prunus subhirtella* Miq.
Identification Manual (Source of nomenclature): Rehder 1940
Common Name: Higan Cherry
Family: Rosaceae
County: DuPage
Date of Collection: 19 June 2001
Collector's Name: Scott N. Kobal
Collection Number: FPD 01-08
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152080
Locality information: Collected at Hidden Lake Forest Preserve near Glen Ellyn.
Habitat: Found growing in an oak woodland.
Associates: *Alliaria petiolata, Arisaema triphyllum, A. dracontium, Fraxinus americana, Lonicera maackii, Parthenocissus quinquefolia, Prunus serotina, P. virginiana, Quercus alba, Ribes missouriense, Rubus pensilvanicus, Ulmus americana,* and *Viburnum recognitum.*
Comments on population size: One shrub observed
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from Eurasia

Scientific Name: *Pyrus betulaefolia* Bunge
Identification Manual (Source of nomenclature): Rehder 1940
Common Name: Birch-leaved Pear
Family: Rosaceae
County: DuPage
Date of Collection: 17 July 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-37
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127652
Locality information: Collected at Hidden Lake Forest Preserve near Glen Ellyn.
Habitat: Found in a shrubby old field adjacent to the Morton Arboretum
Associates: *Bromus inermis, Lonicera maackii, Poa pratensis, Rhamnus cathartica, Rubus occidentalis,* and *Vitis riparia.*
Comments on population size: One shrub observed
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from Asia

Scientific Name: *Rosa centifolia* L.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Cabbage Rose
Family: Rosaceae
County: DuPage
Date of Collection: 26 June 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-24
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127543
Locality information: Collected at Springbrook Prairie Forest Preserve near Naperville.
Habitat: The plants were found in an old hedgerow
Associates: *Achillea millefolium, Arctium minus, Cirsium arvense, Daucus carota, Gleditsia triacanthos, Hemerocallis fulva, Lonicera maackii, Plantago lanceolata, Poa pratensis, Potentilla recta, Prunus serotina, Quercus*

alba, Rubus occidentalis, Rumex crispus, and *Solidago gigantea.*
Comments on population size: Approximately 12 plants observed
Information published elsewhere: No
Significance: New state record
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Rosa virginiana* Mill.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Virginia Rose
Family: Rosaceae
County: DuPage
Date of Collection: 17 June 1998
Collector's Name: Scott N. Kobal
Collection Number: 98-13
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 141107
Locality information: Collected at Waterfall Glen Forest Preserve near Darien.
Habitat: The plants were found growing along the edge of a marsh near Westgate Road
Associates: *Carex lacustris, Cirsium arvense, C. vulgare, Convolvulus sepium, Coronilla varia, Geum canadense, Helianthus grosseserratus, Polygonum scandens, Sonchus uliginosus, Typha* X *glauca, Verbena hastata,* and *Vitis riparia.*
Comments on population size: Approximately two dozen plants seen
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from farther east

Scientific Name: *Rudbeckia amplexicaulis* Vahl
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Annual Black-eyed Susan
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 6 August 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 01-12
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154758
Locality information: Collected at Pioneer Park Forest Preserve in Naperville.
Habitat: The single plant was found growing in a disturbed area where a building had been torn down south of Hobson Road and west of the West Branch of the DuPage River.
Associates: *Abutilon theophrasti, Aster pilosus, Brassica kaber, Carduus nutans, Cirsium arvense, C. vulgare, Daucus carota, Lepidium virginicum, Medicago lupulina, Muhlenbergia schreberi, Oenothera biennis, Plantago major, Rumex crispus, Setaria viridis, Taraxacum officinale,* and *Xanthium strumarium.*
Comments on population size: One plant observed
Information published elsewhere: No
Significance: New county record. Mohlenbrock and Ladd (1978) and Mohlenbrock (2002) report this species from Cook, Greene and Jackson counties. Swink and Wilhelm (1994) report this plant only from Cook County in northeastern Illinois.
Species Native or Alien: Alien – introduced from farther west or south.

Scientific Name: *Rudbeckia speciosa* Wender. var. *sullivantii* (C.L. Boynt. & Beadle) B. L. Rob.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Showy Black-eyed Susan
Family: Compositae (Asteraceae)
County: DuPage
Date of Collection: 27 August 2003
Collector's Name: Scott N. Kobal
Collection Number: FPD 03-32
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155931
Locality information: Collected at the West Branch Forest Preserve near Bartlett.
Habitat: The plants were found growing along the shoreline of a quarry lake south of Smith Road and east of the West Branch of the DuPage River.
Associates: *Agalinis tenuifolia, Ambrosia artemisiifolia* var. *elatior, Apocynum sibericum, Asclepias incarnata, Aster novae-angliae, A. pilosus, Carex granularis, Euphorbia maculata, Festuca elatior, Fragaria virginiana, Juncus nodosus, Leersia oryzoides, Lycopus americanus, Monarda fistulosa, Panicum capillare, P. implicatum, Phalaris arundinacea, Prunella vulgaris* var. *lanceolata, Rhamnus cathartica, Salix interior, Setaria glauca, Trifolium pratense,* and *Vitis riparia.*
Comments on population size: Only a small number of plants seen
Information published elsewhere: No
Significance: New county record. Showy black-eyed Susan occurs in a variety of moist, calcareous habitats (Swink and Wilhelm 1994). This species is occasional in the eastern counties of Illinois (Mohlenbrock 2002). Mohlenbrock and Ladd (1978) cite three counties from northeastern Illinois. Swink and Wilhelm (1994) record this plant from five counties in northeastern Illinois (Kane, Grundy, Cook, Will and Kankakee).
Species Native or Alien: Native

Scientific Name: *Ruellia strepens* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Smooth Ruellia
Family: Acanthaceae
County: Kendall
Date of Collection: 8 August 1999
Collector's Name: Scott N. Kobal
Collection Number: SNK 99-05
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 135690
Locality information: Collected at Baker's Woods Forest Preserve.
Habitat: The plants were found growing on a wooded floodplain along the west bank of Aux Sable Creek approximately 1/8 mile north of Route 52.
Associates: *Asarum canadense, Carex grayi, Celtis occidentalis, Elymus virginicus, Geum canadense, Gleditsia triacanthos, Lysimachia nummularia, Ranunculus septentrionalis, Rhus radicans, Smilax tamnoides* var. *hispida, Ulmus americana,* and *Vitis riparia.*
Comments on population size: Plants were fairly abundant along floodplain
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Rumex maritimus* L. var. *fueginus* (Phil.) Dusén
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Golden Dock
Family: Polygonaceae
County: DuPage
Date of Collection: 13 August 1996
Collector's Name: Scott N. Kobal
Collection Number: 96-24
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 132158
Locality information: Collected at Fullerton Park Forest Preserve near Addison.
Habitat: The plants were found growing at the edge of a small wetland area.
Associates: *Bidens comosa, Eleocharis acicularis, Leersia oryzoides,* and *Lindernia dubia.*
Comments on population size: Plants fairly numerous
Information published elsewhere: No
Significance: New county record. Golden dock is a widespread plant in the United States, being found in 35 of the 50 contiguous states (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) report this species from 11 counties in Illinois, four of these (McHenry, Kane, Grundy and Cook) in northeastern Illinois. Swink and Wilhelm (1994) cite this species from those northeastern Illinois counties, as well as McHenry and Will Counties.
Species Native or Alien: Native

Scientific Name: *Sagina procumbens* L.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Pearlwort
Family: Caryophyllaceae
County: DuPage
Date of Collection: 29 April 2000
Collector's Name: Scott N. Kobal
Collection Number: FPD 00-01
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 148256
Locality information: Collected in Naperville along the Naperville Riverwalk near the West Branch of the DuPage River.
Habitat: Here the plants were found growing abundantly between the paving bricks along the Riverwalk west of Eagle Street.
Associates: No vascular plant associates were noted
Comments on population size: Plants quite abundant in a small area
Information published elsewhere: No
Significance: New county record. Pearlwort is a widespread species in the United States, occurring in 31 of the contiguous 50 states (USDA, NRCS 2004). Mohlenbrock and Ladd (1978) and Mohlenbrock (1986) report *Sagina decumbens* (Elliot) T. & G. as being occasional in the southern half of the state and rare in the northern half. Mohlenbrock (2002) states that *S. procumbens* is apparently confined to the northern quarter of Illinois. Swink and Wilhelm (1994) state that previous reports of *S. decumbens* in the Chicago Region are being referred to as *S. procumbens*. They report *S. procumbens* from Lake, Cook, Kane and Will Counties in northeastern Illinois.
Species Native or Alien: Alien – introduced from the southern states

Scientific Name: *Samolus parviflorus* Raf.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Water Pimpernel
Family: Primulaceae
County: DuPage
Date of Collection: 30 September 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-28
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154931

Locality information: Fullersburg Woods Forest Preserve in Oak Brook.
Habitat: On a shaded mudflat along the edge of Salt Creek.
Associates: *Acnida altissima, Echinochloa crusgalli, Lindernia dubia, Mimulus ringens, Panicum dichotomiflorum, Polygonum persicaria, P. punctatum,* and *Rorippa palustris* var. *fernaldiana.*
Comments on population size: A small number of plants were noted in a confined area
Information published elsewhere: No
Significance: New county record. *Samolus parviflorus* is cited by Mohlenbrock (2002) as occurring occasionally throughout Illinois, except for the northwestern counties. Mohlenbrock and Ladd (1978) report this plant from Lake, Cook, Kendall and Kankakee Counties in northeastern Illinois. Swink and Wilhelm (1994) report this species as rare in the Chicago Region and cite it from the same northeastern Illinois counties as Mohlenbrock and Ladd (1978).
Species Native or Alien: Native

Scientific Name: *Scirpus hattorianus* Makino
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Early Dark Green Rush
Family: Cyperaceae
County: DuPage
Date of Collection: 18 October 1994
Collector's Name: Scott N. Kobal
Collection Number: 94-37
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 123180
Locality information: Fullersburg Woods Forest Preserve
Habitat: Small terrace along wooded floodplain
Associates: *Alliaria petiolata, Aster lateriflorus, Boehmeria cylindrica, Cirsium arvense, Cornus racemosa, Epilobium coloratum, Geum canadense, Impatiens capensis, Lobelia silphilitica, Polygonum punctatum, Rhamnus cathartica, Solidago altissima, Typha angustifolia, Verbena urticifolia, Vitis riparia,* and *Xanthoxylum americanum.*
Comments on population size: Small number of plants in a confined area.
Information published elsewhere: Locality information in Herkert and Ebinger (2002) – based on this collection.
Significance: New county record – State Endangered Species (Illinois Endangered Species Protection Board 1999).
Species Native or Alien: Native

Scientific Name: *Scirpus hattorianus* Makino
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Early Dark Green Rush
Family: Cyperaceae
County: Kendall
Date of Collection: 4 August 2001
Collector's Name: Scott N. Kobal
Collection Number: SNK 01-17
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152691
Locality information: Maramech Woods Nature Preserve
Habitat: The plants were found growing along the edge of a small swale in a northern flatwoods forest.
Associates: *Aster lateriflorus, Boehmeria cylindrica, Carex trichocarpa, Cicuta maculata, Eupatorium maculatum,* and *Solidago patula.*
Comments on population size: Very small number of plants in a confined area
Information published elsewhere: No
Significance: New county record – State Endangered Species (Illinois Endangered Species Protection Board 1999, Herkert and Ebinger 2002).
Species Native or Alien: Native

Scientific Name: *Scirpus paludosus* A. Nelson
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Alkali Bulrush
Family: Cyperaceae
County: DuPage
Date of Collection: 3 July 1997
Collector's Name: Scott N. Kobal
Collection Number: 97-13
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 135752
Locality information: Fischer Woods Forest Preserve
Habitat: Marshy area along the shoulder of Route 83 (Kingery Highway).
Associates: *Hordeum jubatum, Phalaris arundinacea, Scirpus validus* var. *creber,* and *Typha angustifolia.*
Comments on population size: Small number of plants confined to the edge of the marsh where competition from taller vegetation was minimal.
Information published elsewhere: Locality information in Herkert and Ebinger (2002) based on this collection.
Significance: New county record – State Endangered Species (Illinois Endangered Species Protection Board 1999).
Species Native or Alien: Alien – introduced from farther west.

Scientific Name: *Scirpus paludosus* A. Nelson
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Alkali Bulrush
Family: Cyperaceae

County: Kendall
Date of Collection: 19 September 2004
Collector's Name: Scott N. Kobal
Collection Number: SNK 04-05
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 116166
Locality information: Collected at the Morgan Creek Prairie Wetlands owned by the Oswegoland Park District. The plants were found growing near the intersection of Danbury Drive and Windsor Drive in Oswego.
Habitat: This bulrush grew in a wetland area that had salt encrusted on the soil surface and plant growth was sparse.
Associates: *Agrostis alba, Cyperus ferruginescens, Echinochloa crusgalli, Hordeum jubatum, Leersia oryzoides, Panicum dichotomiflorum, Phragmites australis, Polygonum lapathifolium, P. pensylvanicum,* and *Puccinellia distans.*
Comments on population size: Numerous plants were noted in this wetland area.
Information published elsewhere: No
Significance: New county record. State Endangered Species (Illinois Endangered Species Protection Board 1999, Herkert and Ebinger 2002).
Species Native or Alien: Alien–introduced from farther west.

Scientific Name: *Solanum sarachoides* Sendtn.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Hairy Nightshade
Family: Solanaceae
County: DuPage
Date of Collection: 18 July 2000
Collector's Name: Scott N. Kobal
Collection Number: SNK 00-07
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 148866
Locality information: On the grounds of the Morton Arboretum.
Habitat: The plants were found growing in a nursery area by the maintenance buildings on the east side of the arboretum.
Associates: *Abutilon theophrasti, Agropyron repens, Arctium minus, Chenopodium album, Cirsium arvense, Convolvulus sepium, Erigeron canadensis, Hibiscus trionum, Leonurus cardiaca, Lactuca serriola, Oenothera biennis, Polygonum persicaria, P. scandens, Robinia pseudoacacia, Setaria faberi, S. glauca,* and *Sonchus asper.*
Comments on population size: Approximately 12 plants noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from South America

Scientific Name: *Sorghum halepense* (L.) Pers.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Johnson Grass
Family: Gramineae (Poaceae)
County: Kendall
Date of Collection: 2 September 2002
Collector's Name: Scott N. Kobal
Collection Number: SNK 02-09
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155043
Locality information: Collected at Silver Springs State Park near Yorkville.
Habitat: The plants were found growing along a road shoulder in the park.
Associates: *Ambrosia artemisiifolia* var. *elatior, Asclepias syriaca, Bromus inermis, Cichorium intybus, Daucus carota, Oenothera biennis,* and *Solidago canadensis.*
Comments on population size: One small colony noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from the Mediterranean region

Scientific Name: *Spiranthes lacera* Raf.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Slender Ladies' Tresses
Family: Orchidaceae
County: DuPage
Date of Collection: 9 September 2001
Collector's Name: Wayne A. Lampa and Scott N. Kobal
Collection Number: FPD 01-23
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152709
Locality information: Greene Valley Forest Preserve
Habitat: The plants were found growing in a dry portion of a stabilized old field that was taken out of agricultural production in approximately 1970.
Associates: *Achillea millefolium, Andropogon gerardii, Ambrosia artemisiifolia* var. *elatior, Antennaria neglecta, A. plantaginifolia, Aster ericoides, A. novae-angliae, Chrysanthemum leucanthemum* var. *pinnatifidum, Cornus racemosa, Danthonia spicata, Daucus carota, Eupatorium altissimum, Liatris pycnostachya, Medicago lupulina, Panicum implicatum, Plantago lanceolata, Poa pratensis, Prunella vulgaris* var. *lanceolata, Ratibida pinnata, Scutellaria parvula* var. *leonardii, Solidago juncea, S. nemoralis, Trifolium pratense,* and *Vernonia missurica.*
Comments on population size: Only two plants were observed.
Information published elsewhere: No
Significance: New county record. *Spiranthes lacera* is listed as a rare orchid, restricted to the northern half of the

state in 22 counties (Mohlenbrock and Ladd 1978, Mohlenbrock 2002). Swink and Wilhelm (1994) report this orchid from Lake, Kane, Cook, Will, and Kankakee Counties in northeastern Illinois. Sheviak (1974) reported a hybrid between this species and *S. magnicamporum* Sheviak from DuPage County that indicated the presence of *S. lacera* in the area.
Species Native or Alien: Native

Scientific Name: *Tripsacum dactyloides* (L.) L.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Eastern gama-grass
Family: Gramineae (Poaceae)
County: DuPage
Date of Collection: 13 September 1995
Collector's Name: Patricia Armstrong
Collection Number: s.n.
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127864
Locality information: Along Santa Fe Railroad trails by Dolomite Prairie in Waterfall Glen Forest Preserve.
Habitat: Railroad ballast edge and cattail marsh edge.
Associates: *Verbascum thapsus, Erigeron canadensis, Cirsium discolor, Erechtites hieracifolia, Muhlenbergia frondosa, Eupatorium serotinum, Vitis riparia,* and *Nepeta cataria.*
Comments on population size: Small colony noted
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Typha* X *glauca* Godr.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Hybrid Cattail
Family: Typhaceae
County: DuPage
Date of Collection: 27 June 1995
Collector's Name: Scott N. Kobal
Collection Number: 95-25
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 127544
Locality information: Waterfall Glen Forest Preserve
Habitat: Cattail Marsh
Associates: *Acorus calamus, Boehmeria cylindrica, Calamagrostis canadensis, Carex suberecta, Convolvulus sepium, Cornus obliqua, Eupatorium maculatum, Polygonum amphibium* var. *stipulaceum, Spartina pectinata,* and *Vitis riparia.*
Comments on population size: Very abundant in this marsh – very prevalent in the county now.
Information published elsewhere: No
Significance: New county record. *Typha* X *glauca* is a hybrid between *T. angustifolia* L. and *T. latifolia* L. This hybrid is not recorded by Mohlenbrock (1970) or Mohlenbrock and Ladd (1978). Mohlenbrock (2002) reports this species as rare and known only from the northern quarter of Illinois. Swink and Wilhelm (1994) record it from Lake, Cook, Kane, and DeKalb counties
Species Native or Alien: Native

Scientific Name: *Verbena* X *engelmannii* Moldenke
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Engelmann's Vervain
Family: Verbenaceae
County: DuPage
Date of Collection: 24 August 2001
Collector's Name: Scott N. Kobal
Collection Number: FPD 01-19
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 152690
Locality information: Waterfall Glen Forest Preserve near Lemont.
Habitat: Near a thicket at the edge of a dry prairie.
Associates: *Agrimonia grypsosepala, Agrostis alba, Aster sagittifolius, Crataegus mollis, Eupatorium rugosum, Helianthus strumosus, Lonicera maackii, Oenothera biennis, Rhamnus cathartica, Rosa multiflora, Solidago canadensis, S. gymnospermoides,* and *Verbena urticifolia.*
Comments on population size: Approximately 5 or 6 plants seen
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Native

Scientific Name: *Vinca major* L.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Greater Periwinkle
Family: Apocynaceae
County: DuPage
Date of Collection: 20 November 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-34
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 155115
Locality information: Maryknoll Forest Preserve in Glen Ellyn.
Habitat: An apparently spontaneous colony in a weedy area along a spoilpile on the former Maryknoll Seminary site just east of Illinois Route 53 and north of Abbey Drive.
Associates: *Acer negundo, Dipsacus laciniatus, Phalaris arundinacea, Populus deltoides, Rhamnus cathartica, Rhus glabra,* and *Solidago canadensis.*

Comments on population size: A fairly large colony was noted – it has now been destroyed.
Information published elsewhere: No
Significance: New county record
Species Native or Alien: Alien – introduced from southern Europe

Scientific Name: *Wolffia papulifera* C. H. Thomps.
Identification Manual (Source of nomenclature): Swink and Wilhelm 1994
Common Name: Nippled Water Meal
Family: Lemnaceae
County: DuPage
Date of Collection: 17 September 2002
Collector's Name: Scott N. Kobal
Collection Number: FPD 02-23
Herbarium where specimen is deposited: Morton Arboretum, Lisle, IL
Accession Number: 154710
Locality information: Basic Life Forest Preserve in Oak Brook
Habitat: Open water marsh
Associates: *Lemna minor, Spirodela polyrhiza,* and *Wolffia columbiana.*
Comments on population size: Small, mixed with other species of the Lemnaceae.
Information published elsewhere: No
Significance: New county record. Mohlenbrock and Ladd (1978) report nippled water meal only from Lake County in the Chicago region; other reports are from extreme southern or western Illinois. Swink and Wilhelm (1994) report this species from Lake and Cook Counties in northeastern Illinois. This species is found in quiet water, scattered throughout Illinois, usually in association with other species of *Wolffia,* but apparently is not common (Mohlenbrock 1970, Mohlenbrock 2002, Swink and Wilhlem 1994).
Species Native or Alien: Native

LITERATURE CITED

Dirr, M. A. 1998. Manual of woody landscape plants-their identification, ornamental characteristics, culture, propagation and uses. 5th edition. Stipes Publishing L.L.C. Champaign, Illinois.

Ebinger, J. E. 1983. Exotic shrubs a potential problem in natural area management in Illinois. Natural Areas Journal. 3 (1): 3—6.

Gleason, H. A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, New York.

Jones, G. N. and G. D. Fuller. 1955. Vascular plants of Illinois. Urbana: University of Illinois Press, Springfield. Illinois State Museum.

Herkert, J. R. and J. E. Ebinger, editors. 2002. Endangered and Threatened Species in Illinois: Status and Distribution, Volume 1- Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 pp.

Illinois Endangered Species Protection Board. 1999. Checklist of endangered and threatened plants and animals of Illinois. Endangered Species Protection Board, Springfield, Illinois.

Mohlenbrock, R. H. 1970. Guide to the vascular flora of Illinois: Flowering plants, flowering rush to rushes. Carbondale: Southern Illinois University Press.

_____. 1975. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville.

_____. 1978. The illustrated flora of Illinois: Flowering plants, hollies to loasas. Carbondale: Southern Illinois University Press.

_____. 1980. The illustrated flora of Illinois: Flowering plants, willows to mustards. Carbondale: Southern Illinois University Press.

_____. 1981. The illustrated flora of Illinois: Flowering plants, magnolias to pitcher plants. Carbondale: Southern Illinois University Press.

_____. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville.

_____. 1999. The illustrated flora of Illinois Sedges: Carex. Southern Illinois University Press. Carbondale and Edwardsville.

_____. 2001. The illustrated flora of Illinois: Grasses, *Panicum* to *Danthonia* –2nd Edition. Carbondale: Southern Illinois University Press.

_____. 2002. Vascular flora of Illinois. Southern Illinois University Press. Carbondale and Edwardsville.

_____, and D. M. Ladd. 1978. Distribution of Illinois vascular plants. Carbondale: Southern Illinois University Press.

Sheviak, C. J. 1974. An introduction to the ecology of the Illinois Orchidaceae. Illinois State Museum Scientific Paper 14.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region. 4th ed. Indianapolis: Indiana Academy of Science.

USDA, NRCS. 2004. The Plants Database, Version 3.5 (http./plants.usda.gov). National Plant Data Center, Baton Rouge, LA. 70874-4490. USA.

Winterringer, G. S. 1966. Aquatic vascular plants new for Illinois. Rhodora. 68:221—222.

ILLINOIS FLORA UPDATES 2004

NEW DISTRIBUTION RECORDS AND NOTEWORTHY COLLECTIONS

Illinois Flora Updates 2004: new Distribution Records and Noteworthy Collections
David M. Ketzner
Illinois Natural History Survey

Citation: Ketzner, D. 2004. Illinois Flora Updates: New distribution records and noteworthy collections: *Erigenia* 20:98—104.

Scientific Name: *Antennaria plantaginifolia* (L.) Richards.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Pussy-toes
Family: Asteraceae
County: Clay
Date of Collection: 14 May 1984
Collector's Name: David Ketzner
Collection Number: 258
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 172267
Locality information: Charley Brown Park, 2 miles west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Collected on a dry slope above an artificial lake.
Comments on population size: Many stems present in this colony.
Information published elsewhere: No
Significance: New county record. Occasional to common; scattered in Illinois (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Arctium minus* Schk.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Common Burdock
Family: Asteraceae
County: Clay
Date of Collection: 31 July 1993
Collector's Name: David Ketzner
Collection Number: 1564
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 195059
Locality information: North of Flora. SW 1/4, SE 1/4, Sec. 13, T3N, R6E.
Habitat: Collected in a roadside area.
Comments on population size: Unknown population size.
Information published elsewhere: No
Significance: New county record. Common throughout Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe and Asia

Scientific Name: *Asimina triloba* (L.) Dunal
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Pawpaw
Family: Annonaceae
County: Hardin
Date of Collection: 16 April 1994
Collector's Names: David Ketzner and Steve Olson
Collection Number: 1653
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188682
Locality information: Hollow east of Lamb and south of Brokaw Hill. NE 1/4, Sec. 28, T11S, R10E.
Habitat: Found in mesic upland forest.
Comments on population size: Unknown population size.
Information published elsewhere: No
Significance: New county record. Common in the southern counties, becoming less common northward (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Asparagus officinalis* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Asparagus
Family: Liliaceae
County: Clay
Date of Collection: 14 May 1984
Collector's Name: David Ketzner
Collection Number: 255
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)

Accession Number: 171492-1 and 171492-2 (two sheets)
Locality information: Charley Brown Park, 2 miles west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Collected in waste ground.
Comments on population size: Only a few plants present
Information published elsewhere: No
Significance: New county record. Commonly escaped from cultivation and probably in every county (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Chaenorrhinum minus* (L.) Lange
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Dwarf Snapdragon
Family: Scrophulariaceae
County: Clay
Date of Collection: 7 August 1984
Collector's Name: David Ketzner
Collection Number: 521
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 175312
Locality information: 2 miles north of Flora along the Baltimore and Ohio Railroad. S 1/2, Sec. 11, T3N, R6E.
Habitat: Found along the tracks in railroad ballast.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Adventive in Illinois, particularly along railroads (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Crataegus phaenopyrum* (L. f.) Medik.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Washington Thorn
Family: Rosaceae
County: Clay
Date of Collection: 26 June 1993
Collector's Name: David Ketzner
Collection Number: 1536
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188698
Locality information: Northeast of Flora near Elm Creek. SW 1/4, SW 1/4, Sec. 18, T3N, R7E.
Habitat: Found in a thicket along the creek adjacent to a cultivated field.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional in the southern third of the state as well as Cook County (Mohlenbrock 2002). The Cook County record is based on an escape from cultivation (Swink and Wilhelm 1994). The Clay County record reported here may be from a native population, although the collection site was a rather disturbed area.
Species Native or Alien: Native

Scientific Name: *Euonymus atropurpureus* Jacq.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Wahoo
Family: Celastraceae
County: Clay
Date of Collection: 26 June 1993
Collector's Name: David Ketzner
Collection Number: 1538
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188688
Locality information: Northeast of Flora near Elm Creek. NE 1/4, SE 1/4, SE 1/4, Sec. 13, T3N, R6E.
Habitat: Found in a thicket along the creek adjacent to a cultivated field.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional throughout the state (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Galinsoga quadriradiata* Ruiz & Pavon
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Peruvian Daisy
Family: Asteraceae
County: Alexander
Date of Collection: 14 October 1993
Collector's Names: David Ketzner and Mark Basinger
Collection Number: 1616
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 201190
Locality information: Horseshoe Lake State Conservation Area. E 1/2, SE 1/4, SE 1/4, NE 1/4, Sec. 21, T16S, R2W.
Habitat: Collected in a fallow field; elevation ca. 325 feet.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Scattered throughout Illinois (Mohlenbrock and Ladd 1978).
Species Native or Alien: Alien – introduced from tropical America

Scientific Name: *Galium pedemontanum* All.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Yellow-flowered Bedstraw
Family: Rubiaceae
County: Clay

Date of Collection: 17 May 1993
Collector's Name: David Ketzner
Collection Number: 1486
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188674
Locality information: Charley Brown Park, west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Collected from a roadside area and the adjacent lawn.
Comments on population size: Several dozen plants present, but confined to a relatively small area of only a few square yards.
Information published elsewhere: No
Significance: New county record. Previously reported in Illinois only from Champaign County (Mohlenbrock and Ladd 1978, Mohlenbrock 2002).
Species Native or Alien: Alien - introduced from Europe

Scientific Name: *Geranium pusillum* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Small Cranesbill
Family: Geraniaceae
County: Jackson
Date of Collection: 18 May 1993
Collector's Names: David Ketzner and Mark Basinger
Collection Number: 1492
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220486
Locality information: South of Carbondale on campus of Southern Illinois University. W 1/2, Sec. 28, T9S, R1W
Habitat: Found in a picnic area near Campus Lake.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Scattered in waste ground in Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien - native to Europe

Scientific Name: *Gratiola neglecta* Torr.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Clammy Hedge Hyssop
Family: Scrophulariaceae
County: Clay
Date of Collection: 15 May 1993
Collector's Name: David Ketzner
Collection Number: 1484
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 185084
Locality information: West of Clay City. Sec. 22, T3N, R7E.
Habitat: Found in wet ground at the edge of a fallow field, previous to spring planting.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional to common throughout the state (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Hedyotis crassifolia* Raf.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Tiny Bluets
Family: Rubiaceae
County: Clay
Date of Collection: 4 April 1994
Collector's Name: David Ketzner
Collection Number: 1652
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 201188
Locality information: Charley Brown Park, west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Found growing in a park lawn.
Comments on population size: Numerous plants were observed at this site.
Information published elsewhere: No
Significance: New county record. Occasional in the southern and western counties, absent elsewhere (Mohlenbrock 2002 as *Houstonia crassifolia*).
Species Native or Alien: Native

Scientific Name: *Hesperis matronalis* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Dame's Rocket
Family: Brassicaceae
County: Clay
Date of Collection: 15 May 1993
Collector's Name: David Ketzner
Collection Number: 1479
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188685
Locality information: West of Clay City. SE 1/4, SE 1/4, Sec. 22, T3N, R7E.
Habitat: Found as a weed in a field of alfalfa.
Associates: *Medicago sativa* (planted).
Comments on population size: A few dozen plants present.
Information published elsewhere: No
Significance: New county record. Occasionally escaped from cultivation and scattered in Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien - native to Europe and Asia

Scientific Name: *Hydrophyllum virginianum* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Virginia Waterleaf
Family: Hydrophyllaceae
County: Clay
Date of Collection: 15 May 1984
Collector's Name: David Ketzner
Collection Number: 262
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 171498
Locality information: 1.7 miles north of Flora, near Buck Creek. NW 1/4, Sec. 18, T3N, R7E.
Habitat: Collected in a roadside ditch.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional to common throughout the state (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Kickxia elatine* (L.) Dumort.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Canker-root
Family: Scrophulariaceae
County: Clay
Date of Collection: 7 August 1984
Collector's Name: David Ketzner
Collection Number: 523
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 175320
Locality information: 2 miles north of Flora along the Baltimore and Ohio Railroad. S 1/2, Sec. 11, T3N, R6E.
Habitat: Found along the tracks in railroad ballast.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Not common, but scattered in Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Lamium amplexicaule* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Henbit
Family: Lamiaceae
County: Marion
Date of Collection: 10 April 1998
Collector's Name: David Ketzner
Collection Number: 2270
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220516
Locality information: Northeast of Omega at Stephen A. Forbes State Park, at Circle Drive Picnic Area. NE 1/4, NE 1/4, NE 1/4, Sec. 8, T3N, R4E.
Habitat: Found in the lawn of a picnic area.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional to common throughout Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien - introduced from Europe, Asia and Africa

Scientific Name: *Lepidium campestre* (L.) R. Br.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Field Cress
Family: Brassicaceae
County: Clay
Date of Collection: 17 May 1993
Collector's Name: David Ketzner
Collection Number: 1491
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 185112
Locality information: Charley Brown Park, west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Found in disturbed ground.
Comments on population size: Unknown population size.
Information published elsewhere: No
Significance: New county record. Naturalized in disturbed areas; occasional throughout Illinois (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Linum usitatissimum* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Common Flax
Family: Linaceae
County: Saline
Date of Collection: 11 July 1993
Collector's Names: David Ketzner and Mark Basinger
Collection Number: 1553
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188690
Locality information: South of Delta along the Illinois Central Gulf Railroad. Sec. 6, T10S, R5E.
Habitat: Found along the tracks in railroad ballast.
Comments on population size: Only a few plants present.
Information published elsewhere: No
Significance: New county record. Adventive in disturbed areas; occasional throughout the state (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Myosurus minimus* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Mousetail
Family: Ranunculaceae
County: Clay
Date of Collection: 14 May 1984
Collector's Name: David Ketzner
Collection Number: 260
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 171496
Locality information: Charley Brown Park, 2 miles west of Flora. SE 1/4, SW 1/4, Sec. 28, T3N, R6E.
Habitat: Collected in disturbed soil in a picnic area.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Occasional to common in the southern counties, rare northward (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Ornithogalum umbellatum* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Star-of-Bethlehem
Family: Liliaceae
County: Clay
Date of Collection: 15 May 1993
Collector's Name: David Ketzner
Collection Number: 1480
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188697
Locality information: West of Clay City. SW 1/4, SE 1/4, Sec. 22, T3N, R7E.
Habitat: Found in a fallow field, previous to spring planting.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Common throughout the state (Mohlenbrock 2002).
Species Native or Alien: Alien - native to Europe

Scientific Name: *Polygonum persicaria* L.
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Lady's Thumb
Family: Polygonaceae
County: Clay
Date of Collection: 31 July 1993
Collector's Name: David Ketzner
Collection Number: 1563
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220492
Locality information: North of Flora. SW 1/4, SE 1/4, Sec. 13, T3N, R6E.
Habitat: Found in a roadside area.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Naturalized in waste ground and common throughout the state (Mohlenbrock 2002).
Species Native or Alien: Alien - native to Europe

Scientific Name: *Ranunculus abortivus* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Small-flowered Crowfoot
Family: Ranunculaceae
County: Clay
Date of Collection: 15 May 1993
Collector's Name: David Ketzner
Collection Number: 1482
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188702
Locality information: West of Clay City. SW 1/4, SE 1/4, Sec. 22, T3N, R7E.
Habitat: Found in a fallow field, previous to spring planting.
Comments on population size: Unknown population size.
Information published elsewhere: No
Significance: New county record. Common throughout the state (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Ranunculus sardous* Crantz
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Buttercup
Family: Ranunculaceae
County: Clay
Date of Collection: 17 May 1993
Collector's Name: David Ketzner
Collection Number: 1489
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220485
Locality information: Charley Brown Park, west of Flora. NE 1/4, NW 1/4, Sec. 33, T3N, R6E.
Habitat: Found in disturbed ground.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Naturalized in low fields and disturbed areas in Illinois, where it was previously thought confined to a few counties in the southernmost part of the state (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Ranunculus testiculatus* Crantz
Identification Manual (Source of nomenclature): Gleason and Cronquist 1991
Common Name: Bur Buttercup
Family: Ranunculaceae
County: Kendall
Date of Collection: 6 May 1997
Collector's Names: David Ketzner, Mary Harper and Dennis Keene
Collection Number: 1867
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220512
Locality information: Southeast of Plattville along U. S. Route 52, near bridge over Aux Sable Creek. S 1/2, SW 1/4, SW 1/4, NW 1/4, Sec. 15, T35N, R8E.
Habitat: Found in gravel at the edge of the road.
Comments on population size: Only one plant found.
Information published elsewhere: No
Significance: New county record. Naturalized in waste areas, particularly in campgrounds, in the northeastern counties (Mohlenbrock 2002). Swink and Wilhelm (1994) record it from Grundy, Kankakee, Lake and Will Counties (as *Ceratocephalus testiculatus*).
Species Native or Alien: Alien - introduced from the western United States

Scientific Name: *Robinia pseudoacacia* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Black Locust
Family: Fabaceae
County: Clay
Date of Collection: 15 May 1993
Collector's Name: David Ketzner
Collection Number: 1485
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 188686
Locality information: West of Clay City near Mount Zion Church. S 1/2, SW 1/4, Sec. 23, T3N, R7E.
Habitat: Collected in a roadside thicket.
Comments on population size: Many individuals were present at this site. Black locust was the dominant woody plant in the thicket.
Information published elsewhere: No
Significance: New county record. Black locust is native in extreme southeastern Illinois, but commonly planted and escaped from cultivation elsewhere (Mohlenbrock 2002). Undoubtedly an escape from cultivation at this site.
Species Native or Alien: Alien - introduced from farther south

Scientific Name: *Scutellaria australis* (Fassett) Epling
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Small Skullcap
Family: Lamiaceae
County: Clay
Date of Collection: 15 May 1984
Collector's Name: David Ketzner
Collection Number: 264
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 171500
Locality information: Charley Brown Park, 2 miles west of Flora. S 1/2, Sec. 28, T3N, R6E.
Habitat: Collected on a dry, open slope near the edge of an artificial lake.
Comments on population size: Only a few plants present.
Information published elsewhere: No
Significance: New county record. Occasional in the southern half of Illinois (Mohlenbrock 2002).
Species Native or Alien: Native

Scientific Name: *Styrax americana* Lam.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Storax
Family: Styracaceae
County: Hamilton
Date of Collection: 3 June 1996
Collector's Names: David Ketzner, Allen Plocher and Dennis Keene
Collection Number: 1826
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220507
Locality information: Southeast of Belle Prairie City. S 1/2, NE 1/4, Sec. 2, T4S, R6E.
Habitat: Found in wet floodplain forest; elevation ca. 380 feet.
Comments on population size: Only a few plants present.
Information published elsewhere: No
Significance: New county record. According to Mohlenbrock (2002), storax is rare and confined to extreme southern Illinois, although it is known from Kankakee County (Swink and Wilhelm 1994). It is listed as a threatened species in Illinois (Herkert and Ebinger 2002).
Species Native or Alien: Native

Scientific Name: *Thlaspi perfoliatum* L.
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Perfoliate Penny Cress
Family: Brassicaceae
County: Jackson
Date of Collection: 23 April 1993
Collector's Names: David Ketzner and Mark Basinger
Collection Number: 1476
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 185111
Locality information: Lake Murphysboro State Park, west of Murphysboro.
Habitat: Found in a roadside area.
Comments on population size: Unknown population size
Information published elsewhere: No
Significance: New county record. Previously known only from Effingham and Shelby Counties (Mohlenbrock 2002).
Species Native or Alien: Alien – introduced from Europe

Scientific Name: *Tridens strictus* (Nutt.) Nash
Identification Manual (Source of nomenclature): Mohlenbrock 2002
Common Name: Spicate Purple-top
Family: Poaceae
County: Saline
Date of Collection: 13 October 1995
Collector's Name: David Ketzner
Collection Number: 1742
Herbarium where specimen is deposited: Illinois Natural History Survey (ILLS)
Accession Number: 220504
Locality information: East of Harrisburg, northwest of U. S. Route 45 along levee. SE 1/4, Sec. 10, T9S, R6E.
Habitat: Found in a successional field.
Comments on population size: Only a few plants present.
Information published elsewhere: No
Significance: New county record. Not common, scattered throughout the state (Mohlenbrock 2002).
Species Native or Alien: Native

REFERENCES

Gleason, H. A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. 2nd Edition. The New York Botanical Garden, Bronx, New York. 910 pp.

Herkert, J. R. and J. E. Ebinger (editors). 2002. Endangered and threatened species of Illinois: status and distribution. Volume 1: plants. Illinois Endangered Species Protection Board, Springfield. 163 pp.

Mohlenbrock, R. H. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville. 490 pp.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois vascular plants. Southern Illinois University Press, Carbondale and Edwardsville. 282 pp.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago region. 4th edition. Indiana Academy of Science, Indianapolis, Indiana. 921 pp.

Invitation for Submission of Articles

ERIGENIA is a peer-reviewed journal of the Illinois Native Plant Society. We invite the submission of original articles on the biota of Illinois and adjacent states. This is a partial list of articles of interest to society members.

TAXONOMY of vascular plants, fungi, lichens, and mosses

ECOLOGY of native species and plant communities; interactions and effects of birds, mammals, and insects on our ecosystem

NATURAL HISTORY of our state, including geology and geography

ETHNOBOTANY of native plants, their use by Native Americans

CULTURAL HISTORY as it intersects with natural history

BOTANISTS, SCIENTISTS, EXPLORERS, and BOTANICAL ARTISTS who have played a major role in our understanding of our state and its natural resources

RESTORATION of our native landscapes, management techniques and results

HORTICULTURE as it relates to native plants in restored or cultural environments

Material for Flora Updates should be sent to:

Marty Vogt
4252 Humphrey Street
St. Louis, Missouri 63116
mvogt@accessus.net
314-771-7593

Please refer to the next column for information on submitting other manuscripts.

Instructions for Authors

Authors may submit material as an e-mail attachment to Gordon Tucker at cfgct@eiu.edu or on diskette sent to

Dr. Gordon C. Tucker
Department of Biological Sciences
Eastern Illinois University
600 Lincoln Avenue
Charleston, Illinois 61920-3099 U. S. A.

Manuscripts must be submitted as an MS Word document in a single font, double-spaced and left-aligned. Tables and illustrations must fit in a 7 x 9 inch area. Authors should retain copies of all material submitted.

The title page of the manuscript should state the affiliation and complete addresses of all the authors; the telephone number of the corresponding author should also be supplied. All papers will be reviewed and copy-edited.

ABSTRACTS

Research and technical papers should include a one-paragraph abstract of not more than 250 words. The abstract should state concisely the goals, principal results, and major conclusions of the paper.

TAXONOMIC NAMES

Either a standard taxonomic manual should be cited whose names are followed consistently, or the scientific names should be followed by their authority. Common names, if used, should be referenced to a scientific name. Thereafter, scientific names are recommended, but either may be used if done so consistently.

PROOFS

Authors will have the opportunity to review their articles before publication and are expected to correct any errors. The proofs should be returned within one week of receipt.

PAGE CHARGES

Page charges of $15 for members and $25 for non-members will be assessed. The fee will be waived for those who sign a statement that they neither have institutional support for publication nor can afford the page charges.

ILLINOIS NATIVE PLANT SOCIETY
FOREST GLEN PRESERVE
20301 EAST 900 NORTH ROAD
WESTVILLE, ILLINOIS 61883

CONTENTS

ERIGENIA 20, OCTOBER 2004

ERIGENIA

Number 21
November 2006

Journal of the
Illinois Native Plant Society

ERIGENIA

Number 21, November 2006

The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

COVER ILLUSTRATION

Drawing of *Corylus americana*, hazelnut, by Caleb Shelby.

MEMBERSHIP

Yearly membership includes a subscription to *Erigenia* and the quarterly newsletter, *Harbinger*. For more information, visit our website at www.ill-inps@org or write to:

Illinois Native Plant Society
P.O. Box 3341
Springfield, Illinois 62708
e-mail: ilnps@aol.com

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August, 1982.

(ISSN 8755-2000)

ERIGENIA
NUMBER 21, NOVEMBER 2006

TABLE OF CONTENTS

About Our Authors

Paul Bollinger is the Chief Environmental Scientist at Bollinger, Lach & Associates. Paul obtained his M.S. degree in biology with an emphasis in botany from Northern Michigan University. He is responsible for all ecology related projects, which include plant community mapping, vegetative inventories, wetland delineations and mitigation, restoration plans, endangered/threatened species searches and tree surveys for public and private organizations.

Dan Busemeyer is currently an Environmental Planner with Ghostpine Environmental Services Ltd. in Calgary, Alberta. His primary duties include writing environmental conservation and reclamation reports for pipelines, wellsites and access roads and ensuring legislative compliance with regard to various environmental issues relating to oil and natural gas development. He earned an M.S. in Biological Sciences from the University of Cincinnati and a B.S. in Anthropology from the University of Chicago.

Ken Dritz is a computer scientist at Argonne National Laboratory. Well known locally, he is responsible for numerous additions to the Chicago flora over more than 35 years. Ken is also an occasional instructor at the Morton Arboretum, where he has taught hordes of prairie managers how to identify sedges.

John E. Ebinger is emeritus professor of botany at Eastern Illinois University. His research focuses on the structure and composition of forest, glade, and sand prairie communities in Illinois as well as the tropical genus *Acacia*.

James Ellis works as a field botanist for the Critical Trends Assessment Program at the Illinois Natural History Survey. He earned a B.S. in ecology from the University of Illinois and an M.S. in natural resource ecology and management from the University of Michigan.

Mary Ann Feist is a wetland botanist at the Illinois Natural History Survey. She conducts wetland determinations and wetland monitoring for the Illinois Department of Transportation. She is also a graduate student at the University of Illinois in the Department of Plant Biology where she is studying the systematics of *Ptilimnium* and *Oxypolis* from the Apiaceae family.

Don Gardner is a retired dentist with a long interest in agriculture and in prairie restoration. His paper in this issue is a follow-up to papers that appeared in *Erigenia* in 1995 concerning restoration of the same area.

Vincent Gutowski is a professor of geography at Eastern Illinois University, where he has taught for 23 years. He earned his Ph.D. at the University of Pittsburgh. His specialties include geomorphology, field methods, environmental studies, cartography and applied geography.

Ken Johnson works as a restoration ecologist for Conservation Design Forum in Elmhurst, Illinois, and also works part time for Campton Township in Kane County. Most of his professional work involves conducting botanical inventories, vegetation monitoring, and preparing restoration management plans.

Sean Jones holds a B.S. in biology from the University of Central Oklahoma and an M.S. from Eastern Illinois University. His interests include mycology, forest and prairie succession and ectomychorrizal relationships.

Richard L. Larimore is a wetland ecologist with the Illinois Natural History Survey. He is interested in fire ecology, particularly as fire relates to species composition in woodlands.

Paul B. Marcum is an associate research scientist with the Illinois Natural History Survey. His primary duties include conducting wetland delineations, monitoring restored wetlands and performing site assessments for potential wetland restorations. He earned a B.S. in Natural Sciences from Shawnee State

University in Portsmouth, Ohio, and a M.S. in Biological Sciences from Marshall University in Huntington, West Virginia.

April McDonnell is currently a master of science candidate in the Department of Biological Sciences, Eastern Illinois University. Her graduate work focused on the Illinois state endangered plant species *Iliamna remota*. She conducted field work and physiological research on the reproductive biology of this species.

Henry R. Owen is a botany professor at Eastern Illinois University, teaching a wide range of courses for majors, non-majors and M.S. students. His research areas include plant physiology, genetics and tissue culture. He is also the national president of Phi Sigma, the biological sciences honor society.

Loy R. Phillippe is the collections manager for the vascular plants and fungi at the Illinois Natural History Survey. His primary duties include herbarium computerization, specimens collection and preparation and the daily operations of the herbarium. Loy earned a B.S. and M.S. in botany from Eastern Illinois University and a Ph.D. in plant taxonomy from the University of Tennessee.

Robert Van Lonkhuyzen is an ecologist at Argonne National Laboratory where he is primarily involved in the assessment of impacts to wetlands, threatened and endangered species, and terrestrial communities, and the development of impact mitigation. He also conducts biological surveys and develops habitat restoration and management plans.

Erigenia, Number 21, November 2006, pp 3–9

Continuing Vegetation Analyses of a Prairie Restoration in Ford County, Illinois

Don Gardner[1]

Abstract: Prairie restoration work started in 1974 on a former permanent pasture in northern Ford County, Illinois. In 1993, a vegetation analysis of the site and of an included unrestored control area was conducted using point-intercept technique. Frequency and density data were collected and importance value (IV) assigned to individual species. In 1998 and 2004, the analysis was repeated. This paper reports the results from those two more recent surveys with data from both the restoration and the control area. Comparisons illustrate population dynamics on an evolving prairie over the twelve-year period of the study. Native species encountered on the restoration increased from 66.2% (1993) to 71.6% (1998) to 75.8% (2004). *Andropogon gerardii* held the highest IV rank in all sampling years. There were increases in absolute numbers and IV of some conservative species including *Sporobolus heterolepis, Dodecatheon meadia, Dalea candida,* and *D. purpurea*. There were decreases in some exotic species including *Daucus carota, Achillea millefolium,* and *Phleum pratense*. However, other aliens such as *Trifolium pratense, Melilotus* spp. and *Bromus inermis* maintained or increased their numbers. On the control area, the percentage of native species encountered rose from 48.5% (1993) to 58.6% (1998) to 67.9% (2004). Qualitative floristic surveys recorded an increase in absolute numbers of native species from 138 to 154. It is suggested that the periodic collection of quantitative data can contribute significantly to the long-term evaluation and management of a prairie restoration or reconstruction.

Introduction

A 2.95 ha (7.3-acre) former pasture located in northern Ford County near Kempton, Illinois, was selected in 1974 for prairie restoration and reconstruction (Sec 6 T28N R9E; Lat.40.93366° N, Long. 88.23690° W). This work continued with annual preparation and seeding of successive small plots. The final plots were added in 1990 (Gardner 1995a). Within the field, an unrestored 0.19 ha (0.47 acre) serves as a control. In this area, there was no introduction of additional species or intervention other than annual burning. Although the restoration field has doubled in size in recent years, the focus of this study is the original 2.95 ha. It lies within the Grand Prairie Section of the Grand Prairie Division of the Natural Divisions of Illinois (Schwegman et al. 1973). The soils are Swygert and Bryce, somewhat poorly drained, fine-textured silty clay loams (Fehrenbacher 1990). The topography is gently rolling with an elevation difference of about 4.5 m between the high and low portions of the field. Most land in the immediate area is under corn and soybean cultivation. A floristic survey of the field, 1991–1994, documented 138 native vascular species and 51 exotics (Gardner 1995a). A 2003–2004 unpublished floristic survey identified 154 native species on the field, which compares with 180 prairie species found on 29 silt-loam cemetery prairie remnants (Betz and Lamp 1988). The continued presence of about 46 non-native species underscores the developing status of the site.

Monitoring of data can permit identification of population trends and evaluation of the direction of restoration development (Masters 1997). Thus, baseline vegetation data, including species density and frequency, were recorded from the restoration field in 1993 (Gardner 1995b). Vegetation data again were collected in 1998 and 2004. Dates of data collection in the three sampling years were between 28 May and 2 July. This paper reports results of those two subsequent surveys with comparisons to the results of the 1993 survey.

Methods

Five line transects were established in the restoration area in June 1993 and retained for the sampling in

[1] 3584 N 1300 East Rd., Kempton, Illinois 60946.

1998 and 2004. Vegetation along these transects was identified and recorded using a point-intercept method (Mueller-Dombois and Ellenberg 1974). This method was modified by using five holes spaced at 20 cm intervals in the horizontal portion of the point-intercept frame, which was supported about one meter above ground level by four folding legs. A pointed steel rod, 3.4 mm in diameter, was passed successively through each hole. Each plant contacted by the point during descent of the rod was recorded by species. Upon completion of the five intercept readings, the frame was moved along the line transect and the process repeated at 1.5 m intervals. Readings in both 1998 and 2004 were taken at 970 intercept points along the transects on the restoration portion of the study site.

One transect passed through the 0.19 ha control area where no taxa were introduced. There was sampling at 150 intercept points in 1998 and 155 in 2004. Both the restoration and the control were burned annually in late winter or very early spring.

Point-intercept can provide accurate quantitative estimates of non-forest communities for description purposes (Becker and Crockett 1973, Mueller-Dombois and Ellenberg 1974). A disadvantage is that this method is difficult to implement under windy conditions. Wind moves the vegetation and prevents accurate readings beneath the descending point. Heavy accumulations of old vegetation can present another hindrance. Ease of sampling was enhanced by conducting the analysis following burning of the site the previous February or March.

Determinations were made for relative density and relative frequency as described by Mueller-Dombois and Ellenberg (1974) and Cox (1990). Relative density (RD) is computed by dividing the number of intercepted individual stems of a species (I) by the total number of individual stems intercepted of all species (TI) and multiplying by 100, RD = (I/TI) × 100. Relative frequency (RF) is an expression of the number of points at which a species occurs (F), divided by the points of occurrence for all species (TF), and multiplying by 100, RF = (F/TF) × 100. Thus, density is a count of the individual stems intercepted by the descending point. Frequency is an expression of the distribution of the species over the extent of the transects. The sum of relative density and relative frequency gives the importance value (IV) for each species (RD + RF = IV). For the sake of brevity, these numbers are condensed with the IV results presented in this paper.

The non-native grasses, *Poa pratensis* (Kentucky bluegrass) and *P. compressa* (Canada blue grass) were combined as *Poa* spp. due to difficulty at times in distinguishing them in the field. Early in the growing season it can be difficult to differentiate *Melilotus alba* (white sweet clover) and *M. officinalis* (yellow sweet clover). They have been combined as *Melilotus* spp. Nomenclature follows Mohlenbrock (2002).

RESULTS

Restoration transects

The three principal families encountered in all years were Poaceae, Asteraceae, and Fabaceae. Absolute numbers of individual intercepts for natives and exotics of those families appear in Table 1.

Individual counts of native Poaceae increased from 743 to 879 over the 1993–2004 period. Largest numbers were recorded for *Andropogon gerardii* (big bluestem) with an increase from 526 to 665. *Schizachyrium scoparium* (little bluestem) has shown a progressive decline from 97 in 1993 to 28 in 2004, possibly reflecting the mesic nature of the silty clay loam soil. *Elymus canadensis* (nodding wild rye) also showed a decline, as might be expected with this pioneering species.

Both native and non-native Poaceae had dramatic increases in individual count numbers in 1998. Precipitation in March through May that year was 38.74 cm (15.25 inches), 34% higher than the 1995–2005 average of 28.85 cm (11.36 inches) (Illinois State Water Survey 2005). This may have been one factor in promoting increased vegetative growth in 1998. Among the non-natives, *Poa* spp. and *Bromus inermis* (smooth brome) had population spikes in 1998 (Table 1). From 1993 to 2004, *Poa* spp. decreased from 61 to 37 while *B. inermis* increased from 24 to 71 and *Dactylis glomerata* (orchard grass) increased from 3 to 24.

Numbers of individual native Asteraceae encountered have dropped from 350 in 1993 to 209 in 2004. The principal factor in this decrease is *Aster pilosus* (hairy aster) with 148 encounters in 1993 and 13 in 2004. This species was a major component on the field before the start of restoration work, but has since declined with the establishment of more conservative species. Individual counts of *Aster ericoides* (heath aster) and *Ambrosia artemisiifolia* (common ragweed) also show decreases. Among the increasing Asteraceae are *Parthenium integrifolium* (wild quinine), *Oligoneuron rigidum* (stiff goldenrod), *Rudbeckia hirta* (black-eyed Susan), and *Aster novae-angliae* (New England aster). Non-native Asteraceae decreased from 124 individual plant encounters in 1993 to 36 in 2004. This was largely due to *Achillea millefolium* (yarrow), which decreased from 102 to 30.

Native Fabaceae had increases in absolute numbers from 41 from 1993 to 69 in 2004. *Dalea candida* (white prairie clover), *D. purpurea* (purple prairie clover), *Amorpha canescens* (leadplant), and *Lespedeza capitata* (round-headed bush clover) all showed increases, while

Table 1: The three predominant families on the restoration with comparisons of *absolute numbers* of individual native and alien plant contacts in each of the three survey years.

Natives	1993	1998	2004	Non-natives	1993	1998	2004
ASTERACEAE	350	234	209	**ASTERACEAE**	124	93	36
Ambrosia artemisiifolia	52	6	9	*Achillea millefolium*	102	89	30
Ambrosia trifida	2	4	5	*Leucanthemum vulgare*	8	0	3
Aster ericoides	33	30	0	*Sonchus oleraceus*	2	0	0
Aster novae-angliae	1	3	9	*Taraxacum officinale*	12	4	3
Aster pilosus	148	29	13				
Coreopsis palmata	2	11	4	**FABACEAE**	118	141	79
Coreopsis tripteris	0	3	2	*Medicago lupulina*	39	0	4
Echinacea pallida	9	5	9	*Melilotus* spp.	25	84	25
Echinacea purpurea	2	3	0	*Trifolium pratense*	52	57	50
Erigeron annuus	4	7	5	*Trifolium repens*	2	0	0
Eupatorium altissimum	3	0	2				
Helianthus pauciflorus	27	18	22	**POACEAE**	85	247	136
Lactuca canadensis	0	0	1	*Agrostis gigantea*	7	2	0
Liatris pycnostachya	1	0	9	*Bromus inermis*	24	108	71
Oligoneuron rigidum	5	18	44	*Dactylis glomerata*	3	10	24
Parthenium integrifolium	7	3	16	*Elytrigia repens*	16	16	0
Ratibida pinnata	43	71	32	*Phleum pratense*	35	8	4
Rudbeckia hirta	3	8	13	*Poa* spp.	61	103	37
Silphium integrifolium	0	0	3				
Silphium laciniatum	7	15	8				
Solidago altissima	0	0	3				
FABACEAE	41	39	69				
Amorpha canescens	15	18	19				
Baptisia alba	12	5	3				
Dalea candida	8	8	25				
Dalea purpurea	5	4	16				
Lespedeza capitata	1	4	6				
POACEAE	743	1301	879				
Andropogon gerardii	526	1053	665				
Elymus canadensis	17	6	3				
Schizachyrium scoparium	97	78	28				
Sorghastrum nutans	103	133	108				
Sporobolis heterolepis	0	31	75				

Baptisia alba (white wild indigo) declined. Non-native Fabaceae decreased with 118 counted in 1993 and 79 in 2004. *Trifolium pratense* (red clover) and *Melilotus* spp. had similar numbers in 1993 and 2004, while *Medicago lupulina* (black medick) decreased from 39 to 4.

The results for all species on the restoration transects ranked by IV appear in Table 2. In 1998, there were 67 species encountered along the transects, of which 71.6% were natives. The 2004 survey identified 63 species with 75.8% being natives. These compare to 66.2% natives in 1993.

On the restoration areas, *Andropogon gerardii* (big bluestem) ranked highest in relative density and relative frequency in all three years. Its IV ranged from 51.4 (1993) to 73.8 (1998) to 68.2 (2004). In 1993, *Sporobolus heterolepis* (prairie dropseed) was sparsely established on the field and no individuals were encountered at stations along the transects. However, in 1998, it had moved to 17th position in IV rank and in 2004 it showed further increase to sixth ranking with an IV of 7.7.

Certain spring flora have shown consistent increases in IV ranking throughout the time period of the three surveys. *Dodecatheon meadia* (shooting star) advanced from an IV of 0.3 (1993) to 2.7 (1998) to 4.8 (2004). Similarly, *Pedicularis canadensis* (lousewort) has gone from 2.7 to 7.3 to 15.2 over the same period.

Baptisia alba (white wild indigo) showed population decline, a result that is not confirmed by personal

Table 2: Comparisons of importance values of species encountered on the *restoration area* in each of the sampling years using point-intercept method.

	1993	1998	2004		1993	1998	2004
Andropogon gerardii	51.4	73.8	68.2	*Erigeron annuus*	0.5	0.7	0.6
Aster pilosus	16.5	2.9	1.6	*Oligoneuron rigidum*	0.5	1.4	5.3
*Daucus carota**	11.7	0.3	0.2	*Dactylis glomerata**	0.3	1.0	2.7
*Achillea millefolium**	11.5	9.0	3.5	*Dodecatheon meadia*	0.3	2.7	4.8
Sorghastrum nutans	10.6	10.2	11.1	*Eupatorium altissimum*	0.3	0.0	0.2
Schizachyrium scoparium	9.8	5.9	3.2	*Oenothera biennis*	0.3	0.0	0.0
Poa spp.*	6.8	10.4	4.4	*Rudbeckia hirta*	0.3	0.8	1.2
Ambrosia artemisiifolia	6.0	0.6	1.1	*Solanum carolinense**	0.3	0.1	0.0
*Trifolium pratense**	5.7	5.7	5.5	*Ambrosia trifida*	0.2	0.4	0.6
*Potentilla recta**	4.6	0.2	0.0	*Asclepias syriaca*	0.2	0.0	0.2
Ratibida pinnata	4.6	6.4	3.8	*Asparagus officinalis**	0.2	0.0	0.0
*Medicago lupulina**	4.4	0.0	0.5	*Carex vulpinoidea*	0.2	0.1	0.0
Monarda fistulosa	3.9	2.6	0.0	*Coreopsis palmata*	0.2	0.9	0.5
*Phleum pratense**	3.8	0.8	0.5	*Echinacea purpurea*	0.2	0.3	0.0
Aster ericoides	3.5	2.9	0.0	*Oxalis stricta*	0.2	0.0	0.1
Helianthus pauciflorus	2.8	1.6	2.6	*Sonchus oleraceus**	0.2	0.0	0.0
Melilotus spp.*	2.7	7.8	3.0	*Trifolium repens**	0.2	0.0	0.0
Pedicularis canadensis	2.7	7.3	15.2	*Viola pratincola*	0.2	0.0	0.2
*Bromus inermis**	2.6	9.6	8.2	*Aster novae-angliae*	0.1	0.3	0.8
Juncus interior	2.0	1.6	0.6	*Lespedeza capitata*	0.1	0.4	0.7
Elymus canadensis	1.9	0.6	0.4	*Liatris pycnostachya*	0.1	0.0	1.1
*Carex hirta**	1.8	0.0	0.0	*Oenothera pilosella*	0.1	0.0	0.0
*Elytrigia repens**	1.8	1.6	0.0	*Physostegia virginiana*	0.1	0.0	0.8
Fragaria virginiana	1.8	6.5	1.6	*Potentilla simplex*	0.1	0.1	0.0
Amorpha canescens	1.5	1.6	2.1	*Veronicastrum virginicum*	0.1	0.1	0.5
Carex brevior	1.5	2.4	1.1	*Anemone cylindrica*	0.0	0.0	0.5
Zizia aurea	1.5	8.1	18.2	*Brassica rapa**	0.0	0.1	0.0
Baptisia alba	1.4	0.5	0.4	*Carex bebbii*	0.0	0.0	0.5
*Taraxacum officinale**	1.4	0.4	0.4	*Carex molesta*	0.0	0.2	0.0
*Pastinaca sativa**	1.3	0.1	0.2	*Carex muhlenbergii*	0.0	0.2	0.0
Calystegia sepium	1.0	0.2	0.0	*Coreopsis tripteris*	0.0	0.2	0.2
Dalea candida	0.9	0.8	2.9	*Eleocharis verrucosa*	0.0	0.6	0.6
Echinacea pallida	0.9	0.5	1.1	*Fraxinus* sp.	0.0	0.1	0.0
*Leucanthemum vulgare**	0.9	0.1	0.4	*Lactuca canadensis*	0.0	0.0	0.1
*Plantago lanceolata**	0.9	0.0	0.0	*Phlox pilosa*	0.0	0.2	0.0
*Agrostis gigantea**	0.8	0.1	0.0	*Pycnanthemum virginianum*	0.0	0.1	0.0
Eryngium yuccifolium	0.8	1.0	2.1	*Rosa multiflora**	0.0	0.1	0.0
Parthenium integrifolium	0.8	0.3	1.9	*Rumex crispus**	0.0	0.0	0.1
Silphium laciniatum	0.7	1.1	1.0	*Silphium integrifolium*	0.0	0.0	0.4
Dalea purpurea	0.6	0.4	1.9	*Sisyrinchium albidum*	0.0	0.1	0.2
Plantago rugelii	0.6	0.3	0.0	*Solidago altissima*	0.0	0.0	0.4
Prunella vulgaris	0.6	0.0	0.1	*Sporobolis heterolepis*	0.0	2.4	7.7
Asclepias tuberosa	0.5	0.1	0.2				
Asclepias verticillata	0.5	0.1	0.0	Native species	66.2%	71.6%	75.8%

* Non-native species

observation. It is slow to emerge in the spring. In 1993 data collection was not completed until 2 July. In 1998 and 2004, it was completed earlier, on 22 June and 4 June, respectively.

A native species that has increased is *Zizia aurea* (golden Alexanders), which increased in IV from 1.5 (1993) to 8.1 (1998) to 18.2 (2004). Another native that is showing increase is *Oligoneuron rigidum*. The IV for

this species has gone from 0.5 (1993) to 1.4 (1998) to 5.3 (2004).

Among the exotics, *Melilotus officinalis* and *M. alba* had a combined IV of 2.7 in 1993. In 1998, they had moved up in ranking with an IV of 7.8. In 2004, the IV dropped to 3.0. Another non-native legume on the site is *Trifolium pratense*. As noted above, over the twelve-year time period of these surveys, its absolute numbers have not changed to any large extent. Its IV has been 5.7. 5.7, and 5.5.

Control transect

The IV rankings in the control area appear in Table 3. Along with the remainder of the field, the control area had been permanent pasture with no history of cultivation. After 1974, it received annual burning, but there was no introduction of additional species. However, as the adjacent restoration developed, there was encroachment of native species into the control area. During the time span encompassed by the study, the percentage of native species encountered has risen from 48.5% (1993) to 58.6% (1998) and 67.9% (2004).

Poa spp. ranked highest in IV at 35.4 in 1993. They dropped to sixth ranking at IV 9.7 in 2004. During the same period, *Andropogon gerardii* has increased from IV 4.4 to IV 27.6 and *Sorghastrum nutans* (Indian grass) from IV 3.8 to IV 50.4.

Populations of somewhat weedy native species, such as *Aster pilosus*, have been in steady decline on the control area, with IV of 16.4 (1993), 5.7 (1998), and 3.3 (2004). This reflects the similar development on the restoration portion of the field, where *A. pilosus* populations declined when additional native species became established.

One of the earlier successional species, *Ratibida pinnata* (yellow coneflower), is probably indicative of the volatile successional changes underway on the control unit. It has shown an increase from IV 3.8 (1993) to IV 14.1 (2004).

Antennaria neglecta (cat's-foot), a species that was present on the control area when it was a pasture, has steadily increased from IV 7.7 (1993) to 34.2 (2004).

DISCUSSION

Periodic vegetation sampling of a restoration project provides an objective means of evaluation. It can confirm general observations, draw attention to overlooked changes, and contradict subjective empirical judgement. It indicates the successional changes that are an essential component of prairie development.

One assumption that might be drawn from this study is that, although *Andropogon gerardii* held the highest level of IV on the restoration throughout the twelve years, there was no apparent inhibition of establishment of other species. Such high values would suggest that this warm-season grass dominates the field, possibly to the exclusion of other species. However, from 1993 to 2004, the total number of native species on the field as recorded in floristic surveys has increased from 138 to about 154 and the percentage of native species encountered on this point-intercept survey has increased. There were overall increases in the percentage of native species encountered both on the restoration and the control area (Fig. 1). During that time, native species, including *Dodecatheon meadia, Pedicularis canadensis, Dalea* spp., and *Sporobolus heterolepis*, demonstrated population increases. Populations of non-natives such as *Daucus carota, Poa* spp., and *Achillea millefolium* were in decline. It has been observed that spring burning decreases species richness and favors the dominance of warm-season grasses (Steinauer and Collins 1996). The annual late February or March burns on this site did not appear to decrease species richness.

The increase in *Sporobolus heterolepis* is likely due to the low amount or absence of that seed applied during the early years of the restoration project. That species was increased yearly by plant division in a nursery plot in order to increase seed production. Thus, by the late 1980s, greater amounts of seed were applied to newly established restoration plots (Gardner 1995a). Results of these heavier seedings were becoming apparent in the 1998 and 2004 surveys.

In spite of its increase in IV, *Zizia aurea* is not found in large populations throughout the field, as suggested by the relative density of 10.0% and the relative frequency of 8.2%. However, in an area through which one of the transects passes, there are increasingly larger numbers of the species. Only a small amount of the tall native grasses were included in the seeding of this area in 1988 and 1989. The absence of that competition may have permitted *Z. aurea* to become established in greater numbers than in other parts of the field.

Although never having been included in seed mixes, *Oligoneuron rigidum* shows increases in IV on both the restoration and the control. This may prove to be of some concern, but in the author's experience, this goldenrod has not been considered a problem species, as is sometimes the case with *Solidago altissima* (tall goldenrod).

From the increase in IV for *Melilotus* spp. in 1998 and from general field observation, it became apparent that natives were not displacing these alien species. The annual burning of the field may have contributed to the problem, since populations of *Melilotus* spp. have shown increases following burning (Randa & Yunger 2000). There were unsuccessful eradication efforts using different weed wipers with glyphosate herbicide. In 2002, an intensive effort was started and continues

Table 3: Importance value comparisons of species intercepted on the control area in each of the sampling years.

	1993	1998	2004
Poa spp.*	35.4	23.8	9.7
*Daucus carota**	29.5	0.0	0.0
*Phleum pratense**	16.9	4.0	0.0
Aster pilosus	16.4	5.7	3.3
*Achillea millefolium**	10.9	10.7	5.2
Dichanthelium acuminatum	10.9	2.9	0.0
*Brassica rapa**	8.7	2.0	3.7
Antemaria neglecta	7.7	20.5	34.2
Ambrosia artemisiifolia	6.6	0.7	0.0
*Potentilla recta**	5.5	0.0	0.0
*Plantago lanceolata**	4.9	0.0	0.0
Andropogon gerardii	4.4	64.0	27.6
Fragaria virginiana	4.4	2.7	0.0
*Elytrigia repens**	3.8	0.9	4.8
Ratibida pinnata	3.8	7.7	14.1
Sorghastrum nutans	3.8	15.7	50.4
Carex brevior	3.3	3.6	3.7
*Pastinaca sativa**	3.3	1.3	0.7
Aster ericoides	2.2	0.0	0.0
*Bromus inermis**	2.2	7.7	0.0
Carex vulpinoidea	2.2	0.0	0.0
Elymus canadensis	2.2	1.3	0.7
*Medicago lupulina**	2.2	0.0	0.7
*Amaranthus hybridus**	1.1	0.0	0.0
Asclepias syriaca	1.1	0.0	3.7
*Chenopodium album**	1.1	0.0	0.0
Eupatorium altissimum	1.1	1.3	0.0
Juncus interior	1.1	0.0	5.2
Melilotus spp.*	1.1	1.6	0.0
*Persicaria vulgaris**	1.1	2.0	0.7
Prunella vulgaris	1.1	0.7	0.0
*Rumex crispus**	1.1	0.0	0.0
Ambrosia trifida	0.0	11.2	13.6
Anemone cylindrica	0.0	0.9	0.0
Anemone virginiana	0.0	0.0	3.0
Asclepias verticillata	0.0	2.9	0.7
Carex bebbii	0.0	0.0	3.0
Chamaechrista fasciculata	0.0	2.7	1.5
Echinacea pallida	0.0	0.0	1.5
Geum laciniatum	0.0	0.9	0.7
*Leucanthemum vulgare**	0.0	0.7	0.0
Oligoneuron rigidum	0.0	0.0	3.0
Rosa carolina	0.0	0.0	2.2
Schizachyrium scoparium	0.0	0.0	0.7
*Taraxacum officinale**	0.0	0.0	0.7
Native species	48.5%	58.6%	67.9%

* Non-native species

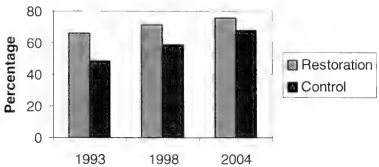


Figure 1: Comparison of percentage changes of native species encountered on the restoration and control areas from 1993 to 2004.

annually with spot spraying and hand pulling from mid April to late July. This has likely contributed to the drop in IV from 7.8 in 1998 to 3.0 in 2004. However, this is a similar IV to that recorded in 1993 when that population was poised to expand. Thus, continued long-term commitment to this effort is necessary.

The slow response to the *Melilotus* problem may have been partly a result of the favorable displacement of the pervasive *Daucus carota* (wild carrot). General distribution of this species on the field before start of the project in 1974 caused concern that this would present a major problem. Ineffectual efforts were made at removal. However, as the native warm season grasses became established, the *D. carota* started to be displaced (Gardner 1995a). General observation suggested that *D. carota* populations were already in decline at the time of the 1993 survey. It then had an IV of 11.7. It dropped in 1998 and, by 2004, it was 0.2. That experience encouraged the false hope that the same would eventually happen with *M. alba* and *M. officinalis*.

The population of the alien legume *Trifolium pratense* is not increasing, but neither is the species being displaced. The numbers of individual plants encountered and the IV remain essentially unchanged. If the *Melilotus* spp. problem can be curtailed, thus providing more available time, it would be advisable to attempt eradication of *T. pratense*.

A factor that may play a role in the continued high populations of some non-native Poaceae is the perimeter effect. The margin of a prairie is an area of conflict for dominance between native and non-native species. It may have higher populations of non-natives than the interior (Christiansen 1990, Taft 2005). As an example, this appears to be true for *B. inermis*. On transects where that species was recorded, the contacts in 2004 were 0.26/m in the interior of the field, while in the 12 m periphery, there were 0.96/m. That represents a 369% greater population in the periphery than the interior.

The control area within the restoration field has evolved from an old field with predominant populations of cool season alien grasses and weedy forbs at the time the restoration project started in 1974 to one with increasing numbers of native prairie species. It appears to demonstrate the vigorous nature of those prairie species when provided with the appropriate conditions of periodic fire, absence of tillage, and a generous adjacent seed source.

Sampling such as this can also draw attention to the slow process of prairie establishment. In 1993, when the project was in its twentieth year, five of the ten species ranking highest in IV were non-natives. By 2004, three non-natives persisted among the top ten species.

Prairie restoration or reconstruction is necessarily a long term commitment. Over a period of years memory can be faulty. Vegetation analysis by this or other popular methods is a means of documenting changes and providing guidance. It should be an essential component of work with prairies.

ACKNOWLEDGMENTS

The author would like to thank Gordon Tucker and John Taft for reviewing drafts of this paper. Their suggestions were both perceptive and helpful.

LITERATURE CITED

Becker, D. A. and J. J. Crockett. 1973. Evaluation of sampling techniques on tall-grass prairie. Journal of Range Management 26:61–65.

Betz, R. F. and H. F. Lamp. 1988. Species composition of old settler silt-loam prairies. pp. 33–39 *in* A. Davis and G. Stanford, eds., Proceedings of the Eleventh North American Prairie Conference. University of Nebraska, Lincoln, Nebraska.

Christiansen, P. A. 1992. Alien species cover on the perimeter of two northwest Iowa prairies. pp. 127–129 *in* D. D. Smith and C. A. Jacobs, eds., Proceedings of the Twelfth North American Prairie Conference. University of Northern Iowa, Cedar Falls, Iowa.

Cox, G. W. 1990. Laboratory manual of general ecology. Wm. C. Brown, Dubuque, Iowa.

Fehrenbacher, D. J. 1990. Soil survey of Ford County, Illinois. Illinois Agricultural Experiment Station Soil Report no. 128.

Gardner, D. 1995a. Prairie restoration on an east-central Illinois field. Erigenia 14:18–31.

Gardner, D. 1995b. Vegetation analysis of a prairie restoration, Ford County, Illinois. Erigenia 14:32–36.

Illinois State Water Survey. 2005. Monthly data for station 114603 (Kankakee), http://www.sws.uiuc.edu/

Masters, L. A. 1997. Monitoring vegetation. pp. 279–301 *in* S. Packard and C. F. Mutel, eds., The tallgrass restoration handbook. Island Press, Washington, D.C. and Corvelo, California.

Mohlenbrock, R. H. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York City, New York.

Randa, L. A. and J. A. Yunger. 2001. A comparison of management techniques on plant species composition and biomass in a tallgrass prairie restoration. pp. 92–97 *in* N. P. Bernstein and L. J. Ostrander, eds., Proceedings of the Seventeenth North American Prairie Conference. North Iowa Area Community College, Mason City, Iowa.

Schwegman, J. E., M. Hutchison, E. G. Paulson, G. B. Fell, W. M. Shepherd, and J. White. 1973. Comprehensive plan for the Illinois Nature Preserves System. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois.

Steinauer, E. M. and S. L. Collins. 1996. Prairie ecology—the tallgrass prairie, *in* F. B. Samson and F. L. Knopf, eds., Prairie conservation: preserving North America's most endangered ecosystem. Island Press, Washington, D.C.

Taft, J. B. 2005. Are small, isolated prairie preserves sustainable? Illinois Natural History Survey Reports 384:5 pp.

Erigenia, Number 21, November 2006, pp 10–21

Vegetation Inventory of the Emiquon Preserve, Fulton County, Illinois

Loy R. Phillippe[1], Daniel T. Busemeyer[1,2], Paul B. Marcum[1], James L. Ellis[1], Mary Ann Feist[1], Richard L. Larimore[1], and John E. Ebinger[1]

Abstract: The vegetation and plant communities of the Emiquon Preserve, Fulton County, Illinois, were studied during the 2003–2004 growing seasons. A total of 395 vascular plant taxa were found; 8 fern and fern-allies, 1 gymnosperm, 99 monocots, and 287 dicots. Overstory and ground layer composition and structure were examined in three second growth forest communities. In the willow zone of the floodplain, tree densities averaged 1192 stems/ha with a basal area of 27.486 m^2/ha, *Salix nigra* Marsh. (black willow) being the leading dominant. In the maple zone of the floodplain, tree densities averaged 506 stems/ha with a basal area of 49.191 m^2/ha, *Acer saccharinum* Marsh. (silver maple) being the leading dominant. In the upland forest, *Robinia pseudoacacia* L. (black locust) dominated with an IV of 112 (possible 200), followed by *Gleditsia triacanthos* L. (honey locust), and *Fraxinus lanceolata* Borkh. (green ash). In this forest, tree densities averaged 672 stems/ha with a basal area of 33.628 m^2/ha.

Introduction

The Emiquon Preserve, Fulton County, Illinois, is located on the west side of the Illinois River, just north of its confluence with the Spoon River and about 4 km north of Havana. Presently owned by The Nature Conservancy, this site is located mostly in the Illinois River floodplain and, in the early 1900s, contained two large oxbow lakes, Thompson and Flag. Thompson Lake was the largest and best known bottomland lake in the Illinois River valley (Havera et al. 2003). These inland lakes were considered the jewels of the Illinois River as sites for harvesting fish and waterfowl. Legal squabbles over fishing and hunting, however, convinced the owners that the lakes would be more valuable as farmland (Clancy 2001).

Presently, these lowlands are composed primarily of cultural communities (croplands, levees, ditches, and developed lands), with small amounts of floodplain forest communities between the levees and the river. The adjacent uplands are composed primarily of the cultural communities (pasture and developed lands) along with a few small, poor quality, second growth forests. The present study was undertaken to determine the structure and composition of the overstory and ground layer of the forest communities and the overall vascular plant species diversity of the Emiquon Preserve.

Description of the Study Area

Located in the extreme southeastern corner of Fulton County, the 2833 ha Emiquon Preserve has been extensively altered by human activities. In early settlement times, the lowlands were dominated by two large oxbow lakes surrounded by floodplain forest communities and marshes. These lowlands are mostly cultivated; the extensive levees and ditches, along with the pumping of excess water into the river, prevents flooding. The slopes to the west and north of the floodplain were primarily forested though small inclusions of prairie probably existed (Schwegman 1973). These uplands and slopes have been logged, and most are in pasture dominated by cool-season Eurasian grasses. During the Illinois Natural Areas Inventory, no high-quality plant communities were found within the boundaries of the preserve (White 1978).

The lowlands of the Emiquon Preserve are located in the Illinois River Section of the Upper Mississippi River and Illinois Rivers Bottomland Natural Division, and the surrounding uplands are part of the Galesburg Section of the Western Forest-Prairie

[1] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Champaign, Illinois 61820.
[2] Present address: Ghost Pine Environmental Services, Ltd., Calgary, Alberta, Canada T2Z 1M9.

Natural Division (Schwegman 1973). Elevation at the preserve varies from 130 m in the south center portion of the floodplain to 177 m in the northwest part of the uplands. The soils of the floodplain are of the Titus-Darwin Association near the Illinois River channel and the Titus-Beaucoup Association closer to the uplands. Both soils are heavy-textured alluvium with high concentrations of clay and silt (Fehrenbacher et al. 1977). The upland soils are more complex with Stronghurst-Rozetta and Fayette-Rosetta associations being formed from thick loess that developed under forest vegetation, and the Fayette-Hickory-Gosport Association that formed from varying amounts of loess, glacial till and shale, and developed under forest vegetation (Fehrenbacher et al. 1977). Also, small intrusions of Littleton-Coffeen and Worthen-Littleton-Raddle associations are present. These soils developed from silty colluvium and alluvium on stream terraces under grassy vegetation.

The climate of central Illinois is continental with hot summers and cool winters and little or no water deficit in any season of the year (Page 1949). Based on weather data from Havana, 4 km to the south, mean annual precipitation is 96.0 cm, with May having the highest rainfall (11.3 cm). Mean annual temperature is 10.8°C with the hottest month being July (mean of 24.6°C), and the coldest being January (mean of −5.0°C). Frost-free days range from 140 to 206, with the average being 173 day per year (Midwestern Regional Climate Center 2004).

MATERIALS AND METHODS

Trips were made to the Emiquon Preserve at various times during the 2003 and 2004 growing seasons. During each visit, voucher specimens were collected, habitat for each species determined, and the plant communities delineated. The specimens collected were identified and deposited in the herbarium of the Illinois Natural History Survey, Champaign, Illinois (ILLS). Designation of non-native status followed Gleason and Cronquist (1991) and Mohlenbrock (2002). Nomenclature followed Mohlenbrock (2002).

In mid-September of 2002, woody overstory surveys were undertaken on three sites, two floodplain forests (willow zone and maple zone) and one upland forest of the Emiquon Preserve. Ten circular plots

Table 1: Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in three forest communities examined at Emiquon Preserve, Fulton County, Illinois.

	Diameter classes (cm)					Total	Basal area	Rel.	Rel.		Av.
Species	10–19	20–29	30–39	40–50	50+	#/ha	m^2/ha	den.	dom.	I.V.	diam. cm
Floodplain Forest—Willow Zone											
Salix nigra	932.4	179.8	33.3	–	–	1145.5	25.861	96.1	94.1	190.2	16.0
Salix amygdaloides	20.0	6.7	6.7	–	–	33.4	1.512	2.8	5.5	8.3	22.1
Salix interior	13.3					13.3	0.113	1.1	0.4	1.5	10.5
Totals	965.7	186.5	40.0			1192.2	27.486	100.0	100.0	200.0	
Floodplain Forest—Silver Maple Zone											
Acer saccharinum	26.6	166.5	193.1	100.0	13.3	499.5	45.994	98.7	93.5	192.2	33.1
Populus deltoides	–	–	–	–	6.7	6.7	3.197	1.3	6.5	7.8	78.2
Totals	26.6	166.5	193.1	100.0	20.0	506.2	49.191	100.0	100.0	200.0	
Upland Forest											
Robinia pseudoacacia	146.5	133.2	46.6	26.6	6.7	359.6	19.714	53.4	58.6	112.0	24.4
Gleditsia triacanthos	–	13.3	20.0	13.3		46.6	4.649	6.9	13.8	20.7	34.7
Fraxinus lanceolata	59.9	6.7	–	–		66.6	3.157	9.9	9.4	19.3	13.2
Ulmus rubra	53.3	6.7	–	6.7		66.7	2.105	9.9	6.3	16.2	17.4
Morus tatarica	20.0	26.6	6.7	–	–	53.3	2.331	7.9	6.9	14.8	23.0
Celtis occidentalis	26.6	–	–	–		26.6	0.333	4.0	1.0	5.0	12.5
Quercus rubra	6.7	6.7	–	–		13.4	0.506	2.0	1.5	3.5	20.9
Prunus serotina	6.7	6.7	–	–		13.4	0.466	2.0	1.4	3.4	19.9
Acer saccharum	13.3	–	–	–		13.3	0.160	2.0	0.5	2.5	12.3
Acer saccharinum	6.7	–	–	–		6.7	0.140	1.0	0.4	1.4	16.2
Juglans nigra	6.7	–	–	–	–	6.7	0.067	1.0	0.2	1.2	11.2
Totals	346.4	199.9	73.3	46.6	6.7	672.9	33.628	100.0	100.0	200.0	

0.03 ha in size were located at 25 m intervals along randomly placed transects in each of the three forests (10 plots/forest). In each plot, all living woody individuals ≥10.0 cm dbh were identified and diameters recorded. From these data, the living-stem density (stems/ha), basal area (m^2/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. As used here, the IV is the sum of the relative density and relative dominance (McIntosh 1957). Density (stems/ha) of wood understory species was determined using nested circular plots 0.0001, 0.001, and 0.01 ha in size located at the center point of the 0.03 ha plots. Four additional 0.0001 ha circular plots were located 6 m from the center points along cardinal compass directions. In the 0.0001 ha plots, woody seedlings (≤50 cm tall) were counted (50 plots/forest); in the 0.001 ha circular plots, small saplings (>50 cm tall and <2.5 cm dbh) were recorded (10 plots/forest); and in the 0.01 ha circular plots, large saplings (2.5–9.9 cm dbh) were tallied (10 plots/forest).

At the time of the overstory surveys, a ground layer survey was also undertaken in each of the three forests, using the transect lines established for sampling the woody overstory. Along each transect, 1 m^2 quadrates were located at 1 m intervals (n=50/transect), odd-numbered quadrates to the right, even-numbered quadrates to the left. A random numbers table was used to determine the number of meters (0 to 9) the quadrate was located from the transect line. Species cover was determined using the Daubenmire cover class system (Daubenmire 1959) as modified by Bailey and Poulton (1968) (class 1 = 0 to 1%, class 2 = >1% to 5%, class 3 = >5% to 25%, class 4 = <25% to 50%, class 5 = >50% to 75%, class 6 = >75% to 95%, class 7 = <(95% to 100%). Importance value (IV) for ground layer species was determined by summing relative cover and relative frequency.

RESULTS AND DISCUSSION

Vascular flora

The vascular flora of the Emiquon Preserve consisted of 395 taxa within 249 genera and 89 families. Probably due to the disturbed nature of the site, non-native species were common, with 102 taxa (25% of the flora), while the fern and fern-allies and gymnosperms were poorly represented, accounting for only 9 taxa (Appendix I). Among the angiosperms, monocots accounted for 99 taxa in 51 genera and 13 families (25%), while dicots were represented by 287 taxa in 92 genera and 71 families (73%). Common families included the Poaceae with 48 species, followed by Asteraceae (44), Cyperaceae (31), and Brassicaceae (19).

Willow zone of the floodplain forest

Located between the Illinois River and levee, this early successional forest was dominated by *Salix nigra* (black willow) with a few other willow species rarely encountered (Table 1). No individuals exceeded 39 cm dbh and most were less than 20 cm dbh. Tree density averaged 1192 stems/ha while basal area was 27.486 m^2/ha. Few woody understory species were encountered (Table 2). The herbaceous vine *Sicyos angulata* (bur cucumber) was the dominant ground layer species followed by *Persicaria pensylvanica*

Table 2: Density (#/ha) of shrubs, seedlings, and small and large saplings in the forest communities studied at Emiquon Preserve, Fulton County, Illinois.

Species	Seedlings	Small saplings	Large saplings
Floodplain—Willow Zone			
Forestiera acuminata	500	600	–
Acer saccharinum	500	150	–
Salix interior	–	500	–
Salix nigra	–	200	240
Morus tatarica	–	50	–
Fraxinus lanceolata	–	50	–
Totals	1000	1550	240
Floodplain—Silver Maple Zone			
Acer saccharinum	18500	–	20
Fraxinus lanceolata	6500	–	–
Forestiera acuminata	4000	–	–
Cephalanthus occidentalis	3500	–	–
Morus tatarica	1000	–	–
Totals	33500	–	20
Disturbed Upland Woods			
Ulmus rubra	1000	500	360
Fraxinus lanceolata	500	150	300
Celtis occidentalis	–	500	80
Carya cordiformis	–	100	40
Acer saccharum	–	50	40
Prunus serotina	–	50	40
Quercus rubra	–	50	–
Jugland nigra	–	–	100
Crataegus mollis	–	–	20
Morus tatarica	–	–	20
Quercus alba	–	–	20
Ribes missouriense	–	1050	–
Rosa multiflora	–	850	–
Cornus drummondii	–	750	–
Sambucus canadensis	–	300	–
Ptelea trifoliata	–	150	–
Rubus occidentalis	–	100	–
Totals	1500	4600	1020

Table 3: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the willow zone at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Sicyos angulatus	100	16.26	23.8	45.3	69.1
Persicaria pensylvanica	96	9.60	22.8	26.8	49.6
Ipomoea lacunosa	76	2.26	18.0	6.3	24.3
Xanthium strumarium	52	0.66	12.4	1.8	14.2
Persicaria amphibium	24	1.58	5.7	4.4	10.1
Commelina diffusa	16	1.92	3.8	5.4	9.2
Aster lanceolatus	12	1.22	2.8	3.4	6.2
Spermacoce glabra	16	0.86	3.8	2.4	6.2
Leersia lenticularis	8	0.62	1.9	1.7	3.6
Fraxinus lanceolata	4	0.60	1.0	1.7	2.7
Forestiera acuminata	4	0.12	1.0	0.3	1.3
Leersia virginica	4	0.12	1.0	0.3	1.3
Pilea pumila	4	0.02	1.0	0.1	1.1
Salix interior	4	0.02	1.0	0.1	1.1
Totals		35.86	100.0	100.0	200.0
Average bare ground and litter		67.80			

(pinkweed) and *Ipomoea lacunosa* (small white morning-glory)(Table 3). Bare ground averaged 68%, probably the result of excessive shading and the length of time water covers the site.

Maple zone of the floodplain forest

The mature second growth floodplain forest studied is located at the southwest edge of the Emiquon Preserve on property owned by the Illinois Department of Natural Resources. *Acer saccharinum* (silver maple) accounted for nearly all of the importance value (IV of 192 out of 200) (Table 1). The only other trees present were a few individuals of *Populus deltoides* (cottonwood). At this site, the sapling and shrub layer was very open with few individuals present, the only common woody plants encountered being seedlings (Table 2). The ground layer was very sparse with bare ground averaging 80%, again the result of flooding (Table 4). Dominant

Table 4: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the silver maple zone at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Leersia virginica	56	13.72	19.4	67.0	86.4
Persicaria pensylvanica	40	2.54	13.9	12.4	26.3
Boehmeria cylindica	36	1.84	12.5	9.0	21.5
Acer saccharinum	44	0.62	15.3	3.0	18.3
Fraxinus lanceolata	32	0.36	11.1	1.8	12.9
Forestiera acuminata	20	0.30	6.9	1.5	8.4
Cephalanthus occidentalis	16	0.38	5.6	1.9	7.5
Leersia lenticularis	12	0.26	4.2	1.2	5.4
Sicyos angulatus	12	0.26	4.2	1.2	5.4
Morus tatarica	12	0.16	4.1	0.8	4.9
Stachys tenuifolia	4	0.02	1.4	0.1	1.5
Vitis riparia	4	0.02	1.4	0.1	1.5
Totals		20.48	100.0	100.0	200.0
Average bare ground and litter		80.30			

Table 5: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the disturbed upland woods at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Poa sylvestris	72	10.86	9.3	21.5	30.8
Alliaria petiolata	100	4.32	13.0	8.5	21.5
Antenoron virginianum	48	6.66	6.2	13.2	19.4
Parthenocissus quinquefolia	52	3.96	6.7	7.8	14.5
Ageratina altissima	40	4.20	5.2	8.3	13.5
Geum canadense	44	3.62	5.7	7.1	12.8
Elymus hystrix	40	2.24	5.2	4.4	9.6
Toxicodendron radicans	28	2.56	3.6	5.0	8.6
Urtica gracilis	28	1.88	3.6	3.7	7.3
Viola pratincola	20	1.56	2.6	3.1	5.7
Aster lateriflorus	20	1.46	2.6	2.9	5.5
Carex blanda	24	1.10	3.1	2.2	5.3
Celtis occidentalis	24	0.32	3.1	0.6	3.7
Ulmus rubra	20	0.50	2.6	1.0	3.6
Pilea pumila	20	0.40	2.6	0.8	3.4
Hackelia virginiana	20	0.30	2.6	0.6	3.2
Teucrium canadense	12	0.84	1.5	1.7	3.2
Carex jamesii	12	0.74	1.5	1.5	3.0
Aster drummondii	16	0.38	2.1	0.7	2.8
Elymus villosus	16	0.38	2.1	0.7	2.8
Acalypha deamii	16	0.08	2.1	0.2	2.3
Sanicula canadensis	12	0.36	1.5	0.7	2.2
Solidago ulmifolia	12	0.16	1.5	0.3	1.8
Fraxinus lanceolata	4	0.60	0.5	1.2	1.7
Aster lanceolatus	8	0.14	1.0	0.3	1.3
Phryma leptostachya	8	0.14	1.0	0.3	1.3
Phytolacca americana	8	0.14	1.0	0.3	1.3
Rosa multiflora	8	0.14	1.0	0.3	1.3
Smilax tamnoides	8	0.14	1.0	0.3	1.3
Acer saccharum	4	0.12	0.5	0.2	0.7
Festuca subverticillata	4	0.12	0.5	0.2	0.7
Lactuca floridana	4	0.12	0.5	0.2	0.7
Sambucus canadensis	4	0.12	0.5	0.2	0.7
Chenopodium album	4	0.02	0.5	–	0.5
Phlox divaricata	4	0.02	0.5	–	0.5
Prunus serotina	4	0.02	0.5	–	0.5
Ribes missouriense	4	0.02	0.5	–	0.5
Smilacina racemosa	4	0.02	0.5	–	0.5
Totals		50.76	100.0	100.0	200.0
Average bare ground and litter		57.04			

herbaceous species included *Leersia virginica* (white grass), *Persicaria pensylvanica*, and *Boehmeria cylindrica* (false nettle).

Upland forest

The few upland forests present on the preserve were disturbed, heavily grazed in the past, and of extremely poor quality with many exotic species. The best quality forest encountered was associated with the uplands, slopes, and ravines at the northern edge of the preserve. At this site, *Robinia pseudoacacia* (black locust) was the dominant overstory species (IV of 112), followed by *Gleditsia triacanthos* (honey locust), *Fraxinus lanceolata* (green ash), *Ulmus rubra* (slippery elm), and *Morus tatarica* (Russian mulberry). Tree density averaged 672 stems/ha while basal area averaged 33.628 m2/ha (Table 1). In this woodlot, numerous

shrubs and saplings were encountered with an overall density of 5620 stems/ha (Table 2). The ground layer was relatively open, bare ground being 57% (Table 5). With 38 species recorded in the plots, *Poa sylvestris* (woodland blue grass), *Antenoron virginianum* (Virginia knotweed), and *Parthenocissus quinquefolia* (Virginia creeper) were the dominant native species. The non-native *Alliaria petiolata* was the second most important herbaceous species found.

Though many disturbance communities were present on the preserve, native species were still common. In the lowlands, members of the Cyperaceae were found along drainage ditches and in a few small marshes scattered throughout the lowlands. However, only a few submersed or emergent aquatic species were found (Appendix I). The lowland forests contained many common native species and relatively few exotics. The upland plant communities, in contrast, were heavily disturbed, but native species were relatively common, particularly upland forest species associated with steep-sided wooded ravines (Appendix I). No endangered or threatened species were encountered. *Acalypha deamii* (large-seeded mercury), a species recently de-listed from threatened in Illinois, was found in both the upland forest and the maple zone of the floodplain forest in the preserve (Herkert and Ebinger 2002).

Literature Cited

Bailey, A. W. and C. E. Poulton. 1968. Plant communities and environmental relationships in a portion of the Tillamook burn, northwestern Oregon. Ecology 49:1–13.

Clancy, P. 2001. Restoring the Illinois River. Nature Conservancy July/August:12–19.

Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43–64.

Fehrenbacher, J. B., B. W. Ray, and J. D. Alexander. 1977. Soil associations of Fulton County, Illinois. University of Illinois Agricultural Experiment Station, Urbana, Illinois. Special Publication 49:1–36 + maps.

Gleason, H. A. and A. Cronquist. 1991. Manual of the vascular flora of northeastern United States and adjacent Canada. Second Edition. The New York Botanical Garden, Bronx, New York. lxxv + 910 pp.

Havera, S. P., K. E. Roat, and L. L. Anderson. 2003. The Thompson Lake/Emiquon Story. Illinois Natural History Survey, Champaign, Illinois. Special Publication 25:iv + 40 pp.

Herkert, J. R. and J. E. Ebinger. 2002. editors. Endangered and threatened species of Illinois: Status and distribution. Volume 1, Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 163 pp.

McIntosh, R. P. 1957. The York Woods. A case history of forest succession in southern Wisconsin. Ecology 38:29–37.

Midwestern Regional Climate Center. 2002. http://mcc.sws.uiuc.edu

Mohlenbrock, R. H. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois. xi + 490 pp.

Page, J. L. 1949. Climate of Illinois. University of Illinois Agricultural Experiment Station Bulletin 39:93–364.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois. 32 pp + map.

White, J. 1978. editor. Illinois Natural Areas Inventory, Technical Report. Illinois Natural Areas Inventory, Urbana, Illinois. xix + 426 pp.

APPENDIX I. Vascular species encountered at The Emiquon Preserve, Fulton County, Illinois, listed alphabetically by family under the major plant groups. An asterisk indicates non-native (exotic) species (*). After the binomial and authority, the communities where the species was observed is given (1 = cultural, 2 = upland forest, 3 = floodplain forest, 4 = riparian). Following the community number(s), collecting numbers preceded by the initial of the collector's name are given (B) Daniel T. Busemeyer, (E) James Ellis, (M) Paul B. Marcum, and (P) Loy R. Phillippe.

PTERIDOPHYTES

Aspleniaceae

Asplenium platyneuron (L.) Oakes: 2, 4; M 2079

Dryopteridaceae

Cystopteris protrusa (Weatherby) Blasdell: 2, 4; P 35554

Dryopteris carthusiana (Villars) H.P. Fuchs: 4; M 2081, P 35560

Polystichum acrostichoides (Michx.) Schott: 2, 4; P 35608

Equisetaceae

Equisetum arvense L.: 1, 4; P 35559

Equisetum hyemale L. ssp. *affine* (Engelm.) Calder & Roy L. Taylor: 4; M 2086

Ophioglossaceae
Botrychium dissectum Spreng.: 2, 4; M 2159
Botrychium virginianum (L.)Sw.: 2; P 35577

SPERMATOPHYTES: GYMNOSPERMS

Cupressaceae
Juniperus virginiana L.: 1; M 2089

SPERMATOPHYTES: ANGIOSPERMS

DICOTS
Aceraceae
Acer negundo L.: 1, 2, 3, 4; B 1242
Acer saccharinum L.: 1, 3, 4;B 1286
Acer saccharum Marsh.: 1, 2, 4; B 1249

Amaranthaceae
**Amaranthus retroflexus* L.: 1; E 22
**Amaranthus spinosus* L.: 1; P 35935

Anacardiaceae
Rhus glabra L.: 1; P 35968
Toxicodendron radicans (L.) Kuntze: 1, 2, 3, 4; B 1302

Apiaceae
Chaerophyllum procumbens (L.) Crantz: 1, 3, 4; B 1269
**Conium maculatum* L.: 1, 4; B 1292
Cryptotaenia canadensis (L.) DC.: 1, 2, 3, 4; M 2070
**Daucus carota* L.: 1; M 2055
Heracleum maximum Bartr.: 1; M 2050
Osmorhiza longistylis (Torr.) DC.: 2, 4; P 35549
**Pastinaca sativa* L.: 1; B 1293
Sanicula canadensis L.: 1, 2, 4; M 2080
Sanicula odorata (Raf.) Pryer & Phillippe: 1, 2, 4; P 35550

Apocynaceae
Apocynum cannabinum L.: 1; M 2017, P 35940, P 35966
Apocynum sibiricum Jacq.: 1; M 2141

Aristolochiaceae
Asarum canadense L.: 2, 4; B 1270

Asclepiadaceae
Ampelamus albidus (Nutt.) Britt.: 1; M 2047
Asclepias incarnata L.: 1; M 2133
Asclepias syriaca L.: 1; M 2012
Asclepias verticillata L.: 1; M 2041

Asteraceae
**Achillea millefolium* L.: 1; P 35630
Ageratina altissima (L.) R.M. King & H. Robins: 2; M 2154
Ambrosia artemisiifolia L.: 1, 3, 4; P 36102
Ambrosia trifida L.: 1, 4, 5; M 2151
**Arctium minus* Schk.: 1, 2, 4; P 35952
**Artemisia annua* L.: 1; E 20
Aster lanceolatus Willd.: 1, 2, 3, 4; Observed
Aster lateriflorus (L.) Britt.: 1, 3, 4; E 36, E 43, E 44
Aster pilosus Willd.: 1; E 12
Aster racemosus L.: 1, 3, 4; E 45
Aster shortii Lindl.: 2; E34, E 35
Bidens cernua L.: 1, 3, 4; M 2022
Bidens frondosa L.: 1, 3, 4; P 36103
**Carduus nutans* L.: 1; P 35618
**Cirsium arvense* (L.) Scop.: 1; M 2027
Cirsium discolor (Muhl.) Spreng.: 1; Observed
**Cirsium vulgare* (Savi) Tenore: 1; P 35934
Conyza canadensis (L.) Cronq.: 1, 2, 3, 4; E 21
Erigeron annuus (L.) Pers.: 1, 2, 3, 4; B 1291
Erigeron philadelphicus L.: 2, 4; P 35587
Erigeron strigosus Muhl.: 1; M 2035
Eupatorium altissimum L.: 1; E 11
Eupatorium perfoliatum L.: 1, 4; P 35926
Eupatorium serotinum Michx.: 1, 3, 4; P 36106
**Helianthus annuus* L.: 1; P 35962
Helianthus hirsutus Raf.: 4; E 42
Helianthus tuberosus L.: 4; P 36108
Lactuca canadensis L.: 1, 2, 4; P 35948
Lactuca floridana (L.) Gaertn. : 2; M 2153
**Lactuca saligna* L.: 1; P 35941
**Lactuca serriola* L.: 1; M 2109
**Matricaria discoidea* DC.: 1; M 2032, P 35619
Rudbeckia laciniata L.: 4; Observed
Rudbeckia triloba L.: 4; M 2069
Silphium perfoliatum L.: 4; M 2059
Solidago canadensis L.: 1, 3, 4; P 36116
Solidago ulmifolia Muhl.: 2, 4; E 37
**Sonchus asper* (L.) Hill: 1; B 1312
**Taraxacum officinale* Weber: 1, 3, 4; B 1274
**Tragopogon pratensis* L.: 1; P 35631
Verbesina alternifolia (L.) Britt.: 4; P 36109
Vernonia fasciculata Michx.: 1; P 35953
Vernonia gigantea (Walt.) Trel.: 1; P 35939
Xanthium strumarium L.: 1, 3, 4; E 13

Balsaminaceae
Impatiens capensis Meerb.: 4; P 35927

Berberidaceae
Podophyllum peltatum L.: 2; P 35574

Bignoniaceae
Campsis radicans (L.) Seem.: 1, 3, 4; M 2136

Boraginaceae
Hackelia virginiana (L.) I.M. Johnston: 1, 2, 4; M 2082
Myosotis verna Nutt.: 1, 2; B 1301

Brassicaceae
**Alliaria petiolata* (Bieb.) Cavara & Grande: 1, 2; B 1272
Arabis laevigata (Willd.) Poir.: 2; P 35558
Arabis shortii (Fern.) Gl.: 2; B 1287
**Barbarea vulgaris* R. Br.: 1, 4; B 1278
**Brassica juncea* (L.) Czern.: 1; M 2034
**Capsella bursa-pastoris* (L.) Medik.: 1, 3, 4; B 1279
Cardamine parviflora L.: 3, 4; P 35597
**Cardaria draba* (L.) Desv.: 1; B 1315
Dentaria laciniata Muhl.: 2; B 1253, E 75
**Erysimum repandum* L.: 1; B 1289
**Lepidium densiflorum* Schrader: 1; P 35600
Lepidium virginicum L.: 1; M 2033, P 35563
Nasturtium officinale R. Br.: 1; P 35636
Rorippa palustris (L.) Besser var. *fernaldiana* (Butters & Abbe) Stuckey: 1, 3, 4; B 1324
Rorippa sessiliflora (Nutt.) A. Hitchc.: B 1326
**Sisymbrium loeselii* L.: 1; E 47, M 2039, P 35586.1
**Sisymbrium officinale* (L.) Scop. var. *officinale*: 1; B 1298
**Sisymbrium officinale* (L.) Scop. var. *leiocarpum* DC.: 1; M 2057
**Thlaspi arvense* L.: 1; B 1281

Casesalipinaceae
Cercis canadensis L.: 2, 4; B 1245
Gleditsia triacanthos L.: 2, 4; P 35570
Gymnocladus dioicus (L.) K. Koch: 2, 4; M 2101

Campanulaceae
Campanulastrum americanum (L.) Small: 4; M 2060
Lobelia inflata L.: 1, 4; P 36113
Lobelia siphilitica L.: 4; P 35959; P 36112
Triodanis perfoliata (L.) Nieuw.: 1; M 2038

Cannabinaceae
**Cannabis sativa* L.: 1; Observed

Capparaceae
Polanisia dodecandra (L.) DC.: 1; M 2142

Caprifoliaceae
**Lonicera maackii* (Rupr.) Maxim.: 1, 2, 4; P 35590
Sambucus canadensis L.: 1, 3, 4; M 2019

Caryophyllaceae
**Arenaria serpyllifolia* L.: 1; P 35627
Cerastium nutans Raf.: 1; B 1277
**Cerastium pumilum* Curtis: 1; P 35627.2
**Dianthus armeria* L.: 1; B 1299
**Holosteum umbellatum* L.: 1; E 81
**Saponaria officinalis* L.: 1; M 2031
Silene antirrhina L.: 1; B 1299, P 35562
**Stellaria media* (L.) Cyrillo: 1; B 1247

Celastraceae
**Euonymus alatus* (Thunb.) Sieb.: 1, 2; P 35582
Euonymus atropurpureus Jacq.: 2; M 2073

Ceratophyllaceae
Ceratophyllum demersum L.: 1; E 18

Chenopodiaceae
**Chenopodium album* L.: 1; E 15
Chenopodium simplex (Torr.) Raf.: 1; M 2145

Convolvulaceae
Calystegia sepium (L.) R. Br.: 1, 4; M 2048
**Convolvulus arvensis* L.: 1; B 1327, M 2049
**Ipomoea hederacea* (L.) Jacq.: 1; P 35957
Ipomoea lacunosa L.: 1; M 2147

Cornaceae
Cornus drummondii C.A. Mey.: 1, 2; B 1310, P 35946, P 35947

Corylaceae
Ostrya virginiana (Miller) K. Koch: 2; B 1255

Cucurbitaceae
Sicyos angulatus L.: 4; B 1314

Elaeagnaceae
**Elaeagnus umbellata* Thunb.: 1, 2; B 1266

Euphorbiaceae
Acalypha deamii (Weatherby) Ahles: 2, 3; M 2146, M 2152, M 2155
Acalypha ostryifolia Riddell: 1; P 35969
Acalypha rhomboidea Raf.: 3, 4; M 2149
Chamaesyce humistrata (Engelm.) Small: 1, 4; E 27
Chamaesyce maculata (L.) Small: 1; P 36105
Chamaesyce nutans (Lag.) Small: 1; M 2116
Poinsettia dentata (Michx.) Kl. & Garcke: 1; P 35965

Fabaceae
Amorpha fruticosa L.: 1, 4; P 35642
Amphicarpaea bracteata (L.) Fern.: 1, 2, 4; P 36114
Apios americana Medic.: 1; P 35960
**Lotus corniculatus* L.: 1; M 2129
**Medicago lupulina* L.: 1; P 35599
**Medicago sativa* L.: 1; B 1295
**Melilotus alba* Medic.: 1; M 2028
**Melilotus officinalis* (L.) Pallas: 1; P 35622
**Robinia pseudoacacia* L.: 1, 2; P 35591
**Securigera varia* (L.) Lassen: 1; B 1318, M 2020
Strophostyles helvula (L.) Ell.: 1; M 2087
**Trifolium campestre* Schreb.: 1; B 1309
**Trifolium pratense* L.: 1; B 1294

**Trifolium repens* L.: 1; P 35620.2

Fagaceae
Quercus alba L.: 2; E 39
Quercus imbricaria Michx.: 2; P 35594
Quercus macrocarpa Michx.: 2; P 35588
Quercus muhlenbergii Engelm.: 2; P 35584
Quercus palustris Muench.: 1; Observed
Quercus rubra L.: 2; P 35593
Quercus velutina Lam.: 1, 2; E 40

Fumariaceae
Dicentra cucullaria (L.) Bernh.: 2, 4; B 1244

Geraniaceae
Geranium carolinianum L.: 1, 4; P 35624

Grossulariaceae
Ribes missouriense Nutt.: 1, 2, 4; B 1263

Hippocastanaceae
Aesculus glabra Willd.: 2, 4; B 1267

Hydrophyllaceae
Ellisia nyctelea L.: 1, 2, 3, 4; B 1264
Hydrophyllum appendiculatum Michx.: 2; P 35604
Hydrophyllum virginianum L.: 2, 4; P 35557

Hypericaceae
**Hypericum perforatum* L.: 1; M 2051
Hypericum prolificum L.: 1; M 2140

Juglandaceae
Carya cordiformis (Wangenh.) K. Koch: 2; P 35589
Carya illinoiensis (Wangenh.) K. Koch: 1; P 35950
Carya ovalis (Wangenh.) Sarg.: 2; M 2091A
Carya ovata (Mill.) K. Koch: 2; P 35595
Juglans cinerea L.: 4; P 36111
Juglans nigra L.: 1, 2, 4; P 35612

Lamiaceae
Agastache nepetoides (L.) Ktze.: 4; P 36107
**Glechoma hederacea* L.: 12, 3, 4; E 79
**Lamium amplexicaule* L.: 1; B 1251
**Lamium purpureum* L.: 1, 4; B 1271
**Leonurus cardiaca* L.: 1, 4; B 1305
Lycopus americanus Muhl.: 1; P 35930
**Mentha arvensis* L.: 1; P 35929
Monarda fistulosa L.: 1, 4; M 2076
**Nepeta cataria* L.: 1, 4; P 35949
Physostegia virginiana (L.) Benth.: 1, 3; P 35964
Prunella vulgaris L.: 1; M 2094
Scutellaria lateriflora L.: 1; P 35954
Stachys tenuifolia Willd.: 1; M 2098
Teucrium canadense L.: 1, 4; M 2023

Lauraceae
Sassafras albidum (Nutt.) Nees: 1, 2; B 1283

Malvaceae
**Abutilon theophrastii* Medic.: 1; M 2042
Hibiscus laevis All.: 4; P 35931
**Hibiscus trionum* L.: 1; M 2120
**Malva neglecta* Wallr.: 1; E 10
**Sida spinosa* L.: 1; M 2119, P 35937

Menispermaceae
Menispernum canadense L.: 4; P 36115

Mimosaceae
Desmanthus illinoensis (Michx.) MacM.: 1; M 2114

Molluginaceae
**Mollugo verticillata* L.: 1, 3, 4; E 23

Moraceae
**Maclura pomifera* (Raf.) Schneider: 1, 4; B 1306
Morus rubra L.: 2; P 35581.2
**Morus tatarica* L.: 1; B 1268

Nyctaginaceae
**Mirabilis nyctaginea* (Michx.) MacM.: 1; B 1321

Oleaceae
Forestiera acuminata (Michx.) Poir.: 3, 4; B 1325, M 2043
Fraxinus americana L.: 2; E 38
Fraxinus lanceolata Borkh.: 1, 3, 4; B 1322
**Syringa vulgaris* L.: 1; E 80

Onagraceae
Oenothera biennis L.: 1, 4; M 2112

Oxalidaceae
Oxalis stricta L.: 1, 2, 3, 4; P 35586

Phrymaceae
Phryma leptostachya L.: 4; M 2075

Phytolaccaceae
Phytolacca americana L.: 1, 2, 4; M 2030

Plantaginaceae
Plantago aristata Michx.: 1; M 2077
**Plantago lanceolata* L.: 1; P 35625
Plantago rugelii Decne.: 1, 2, 3, 4; M 2015, M 2083
Plantago virginica L.: 1; P 35564

Platanaceae
Platanus occidentalis L.: 4; E 41

Polemoniaceae
Phlox divaricata L.: 2; B 1260

Polygonaceae
Antenoron virginianum (L.) Roberty & Vautier: 2; M 2156
Fallopia scandens (L.) Holub: 1, 4; P 36110
Persicaria amphibium (L.) S.F. Gray: 1, 4; P 35963
Persicaria hydropiperoides (Michx.) Small: 1, 4; P 35941
Persicaria lapathifolia (L.) S.F. Gray: 1, 4; M 2108
Persicaria pensylvanica (L.) Small: 1, 3, 4; P 36101
Persicaria punctata (Ell.) Small: 1, 3, 4; P 35933
Persicaria vulgaris Webb & Moq.: 1; M 2013, M 2046
**Polygonum arenastrum* Boreau: 1; M 2058
Polygonum erectum L.: 1; E 46
**Reynoutria japonica* Houtt.: 1; M 2061
**Rumex acetosella* L.: 1, 2; P 35567
Rumex altissimus Wood: 1, 4; P 35569
**Rumex crispus* L.: 1; P 35616
**Rumex patientia* L.: 1, 4; M 2066

Portulacaceae
Claytonia virginica L.: 2, 4; B 1243
**Portulaca oleracea* L.: 1; P 36104

Ranunculaceae
Anemone virginiana L.: 1; M 2097
Enemion biternatum Raf.: 2; B 1252, E 74
Ranunculus abortivus L.: 2, 3, 4; B 1259, B 1280
Ranunculus sceleratus L.: 1; P 35637
Ranunculus septentrionalis Poir. var. *septentrionalis*: 3, 4; B 1282

Rosaceae
Agrimonia pubescens Wallr.: 2; M 2095, M 2158
Crataegus mollis (Torr. & Gray) Scheele: 3, 4; B 1286
Geum canadense Jacq.: 1, 2, 4; M 2064
Potentilla norvegica L.: 1, 3, 4; M 2014
**Potentilla recta* L.: 1, 2; M 2016
Prunus hortulana Bailey: 1; B 1258, B 1311
Prunus serotina Ehr.: 1, 2, 4; M 2026, P 35571
**Rosa multiflora* Thunb.: 1, 2, 4; P 35605
Rubus allegheniensis Porter: 1, 2; P 35581.1
Rubus flagellaris Willd.: 1; P 35602
Rubus occidentalis L.: 1, 2, 3; P 35572
Rubus pensilvanicus Poir.: 1, 2; P 35598

Rubiaceae
Cephalanthus occidentalis L.: 1, 3, 4; M 2045
Galium aparine L.: 1, 2, 4; P 35551
Galium circaezans Michx. var. *hypomalacum* Fernald: 2, 4; M 2093
Spermacoce glabra Michx.: 4; M 2044, M 2118

Rutaceae
Ptelea trifoliata L.: 1, 2; M 2131, P 35609

Salicaceae
Populus deltoides Marsh.: 1, 3, 4; B 1250, B 1254
Salix amygdaloides Anderss.: 1, 4; M 2139
Salix interior Rowlee: 1, 4; B 1256
Salix nigra Marsh.: 1, 3, 4; B 1284, P 35601

Scrophulariaceae
Leucospora multifida (Michx.) Nutt.: 1, 4; M 2121
Mimulus ringens L.: 1; M 2132
**Verbascum blattaria* L.: 1; B 1290, M 2053
**Verbascum thapsus* L.: 1; M 2088
**Veronica arvensis* L.: 1; M 2037, P 35626
Veronica peregrina L.: 1; P 35603

Solanaceae
Datura stramonium L. var. *tatula* (L.) Torr.: 1; M 2135
Physalis subglabrata MacK. & Bush: 1, 4; B 1323, M 2115
Physalis virginiana Miller: 1; M 2025
Solanum carolinense L.: 1; M 2024
Solanum ptychanthum Dunal.: 1, 2, 3, 4; M 2040

Staphyleaceae
Staphylea trifolia L.: 2, 4; P 35607

Tiliaceae
Tilia americana L.: 1, 4; P 35580

Ulmaceae
Celtis occidentalis L.: 1, 2, 4; M 2072
Ulmus americana L.: 1, 2, 3, 4; B 1240
**Ulmus pumila* L.: 1; B 1248
Ulmus rubra Muhl.: 2, 3, 4; B 1265

Urticaceae
Boehmeria cylindrica (L.) Sw.: 1, 3, 4; M 2078
Laportea canadensis (L.) Wedd.: 3, 4; M 2148
Parietaria pensylvanica Muhl.: 1, 2, 4; M 2099
Pilea pumila (L.) Gray: 3, 4; E 29
Urtica gracilis Ait.: 1, 3, 4; M 2062

Verbenaceae
Phyla lanceolata (Michx.) Greene: 1, 4; M 2117
Verbena hastata L.: 1; M 2122
Verbena stricta Vent.: 1; M 2054
Verbena urticifolia L.: 1, 2, 3; M 2065

Violaceae
Viola bicolor Pursh: 1; B 1275

Viola pratincola Greene: 1, 4; B 1276
Viola pubescens Ait. var. *eriocarpa* (Schwein.) Russell: 2, 4; B 1261
Viola sororia Willd.: 2, 3, 4; B 1262

Vitaceae
Ampelopsis cordata Michx.: 4; M 2068
Parthenocissus quinquefolia (L.) Planch.: 1, 2, 4; Observed
Vitis cinerea (Engelm.) Engelm.: 1, 2, 3, 4; M 2084
Vitis riparia Michx.: 1, 2, 3, 4; P 35596
Vitis vulpina L.: 1, 3, 4; P 35615

Zygophyllaceae
Tribulus terrestris L.: 1; P 35958

MONOCOTS
Alismataceae
Sagittaria latifolia Willd.: 1; Observed

Araceae
Arisaema triphyllum (L.) Schott: 2; B 1289

Commelinaceae
Commelina communis L.: 1, 3; M 2157
Commelina diffusa Burm. f.: 3; M 2138

Cyperaceae
Bolboschoenus fluviatilis (Torr.) Sojak.: 1; Observed
Carex aggregata Mack.: 1; P 35568
Carex albicans Willd.: 2; P 35579
Carex albursina Sheldon: 2; P 35606
Carex blanda Dewey: 2; P 35553
Carex brevior (Dewey) Mack.: 1; P 35629
Carex conjuncta Boott: 2; P 35614
Carex davisii Schwein. & Torr.: 1, 4; B 1304
Carex digitalis Willd.: 2; P 35575
Carex festucacea Schkuhr: 1; M 2018
Carex frankii Kunth: 1; M 2125
Carex granularis Muhl.: 1; P 35632
Carex gravida Bailey: 1; P 35641
Carex grisea Wahl: 2; P 35555
Carex hirsutella Mack.: 2; B 1303
Carex hirtifolia Mack.: 2; P 35578
Carex jamesii Schwein.: 2, 4; P 35552
Carex laeviconica Dewey: 1; B 1316, P 35634
Carex leavenworthii Dewey: 2; P 35561, P 35566
Carex lurida Wahl: 1; P 35639
Carex molesta Mack. ex Bright: 1; M 2090, P 35640
Carex normalis Mack.: 1, 2; B 1319
Carex radiata (Wahl.) Small: 2, 4; P 35576
Carex sparganioides Muhl.: 2; P 35611
Carex stipata Muhl.: 1, 2; P 35638
Carex vulpinioidea Michx.: 1; B 1320
Cyperus erythrorhizos Muhl.: 1; M 2107
Schoenoplectus acutus (Muhl.) A. Love & D. Love: 1; P 35635
Schoenoplectus pungens (Vahl) Palla: 1; M 2134
Shoenoplectus tabernaemontani (K.C. Gmel.) Palla: 1; M 2021
Scirpus atrovirens Willd.: 1; M 2113

Hydrocharitaceae
Elodea nuttallii (Planch.) St. John: 1, 2, 4; E 17

Iridaceae
**Belamcanda chinensis* (L.) DC.: 1; M 2091B

Juncaceae
Juncus tenuis Willd.: 1, 2; M 2056, M 2092
Juncus torreyi Coville: 1; M 2126, P 35932

Lemnaceae
Lemna minor L.: 1; M 2111, P 35956
Wolffia columbiana Karst.: 4; M 2071

Liliaceae
Erythronium albidum Nutt.: 2; B 1246
**Hemerocallis fulva* (L.) L.: 1; M 2052
**Ornithogalum umbellatum* L.: 1, 4; P 35585
Polygonatum commutatum (Schult.) A. Dietr.: 1; M 2130
Smilacina racemosa (L.) Desf.: 2; Observed
Trillium recurvatum Beck: 2, 4; B 1273

Poaceae
Agrostis gigantea Roth: 1, 4; M 2063
Andropogon gerardii Vitman: 1; P 35944
Andropogon virginicus L.: 1; Observed
Bouteloua curtipendula (Michx.) Torr.: 1; M 2128
**Bromus inermis* Leyss.: 1; P 35628
**Bromus tectorum* L.: 1; P 35617
Buchloë dactyloides (Nutt.) Engelm.: 1; P 35951
**Chloris verticillata* Nutt.: 1; P 35942
**Dactylis glomerata* L.: 1; P 35623
Dichanthelium acuminatum (Sw.) Gould & Clark var. *fasciculatum* (Torr.) Freckm.: 1; B 1300
**Digitaria ischaemum* (Schreb.) Schreb.: 1; E 32
**Digitaria sanguinalis* (L.) Scop.: 1; E 24, M 2110
Echinochloa muricata (Michx.) Fern. var. *muricata*: 1; M 2085
Echinochloa muricata (Michx.) Fern. var. *wiegandii* (Fassett) Mohlenbr.: 1; P 35936
**Eleusine indica* (L.) Gaertn.: 1; M 2104, P 35938
Elymus canadensis L.: 1; M 2123
Elymus hystrix L.: 2; B 1313
Elymus villosus Muhl.: 3, 4; M 2074
Elymus virginicus L.: 1, 3, 4; M 2067
**Eragrostis cilianensis* (All.) Vign.: 1; E 26, M 2102
Eragrostis pectinacea (Michx.) Nees: 1; E 33, M 2103
**Festuca pratensis* Huds.: 1; P 35621

Festuca subverticillata (Pers.) E.B. Alexeev.: 2, 4; P 35583
Glyceria striata (Lam.) Hitchc.: 1, 3, 4; P 35967
Hordeum jubatum L.: 1; B 1307
Hordeum pusillum Nutt.: 1; P 35565
Leersia lenticularis Michx.: 3; M 2143
Leersia oryzoides (L.) Swartz: 1, 4; Observed
Leersia virginica Willd.: 1, 4; M 2144
Leptochloa fascicularis (Lam.) Gray: 1; M 2106
**Lolium multiflorum* Lam.: 1; B 1297
Muhlenbergia schreberi J.F. Gmel.: 1; E 31
Panicum capillare L.: 1; E 25
Panicum dichotomiflorum Michx.: 1; E 14
Panicum virgatum L.: 1; P 35943
**Phalaris arundinacea* L.: 1, 3, 4; B 1296
**Phleum pratense* L.: 1; M 2100
**Poa compressa* L.: 1, 2; M 2096
**Poa pratensis* L.: 1, 2; P 35620.1
Poa sylvestris Gray: 2; P 35556
**Setaria faberi* F. Herrm.: 1; M 2105
Setaria glauca (L.) P. Beauv.: 1; P 35925
**Setaria italica* (L.) P. Beauv.: 1; M 2150
**Setaria viridis* (L.) P. Beauv.: 1; M 2036
Sphenopholis intermedia (Rydb.) Rydb.: 2; P 35610
Sporobolus cryptandrus (Torr.) Gray: 1; E 28
Sporobolus neglectus Nash: 1; E 16
Tridens flavus (L.) Hitchc.: 1, 2; P 35961

Potamogetonaceae
**Potamogeton crispus* L.: 1; P 35633
Potamogeton foliosus Raf.: 1; P 35955

Smilicaceae
Smilax tamnoides L. var. *hispida* (Muhl.) Fern.: 1, 2, 4; P 35573

Sparganiaceae
Sparganium eurycarpum Engelm.: 1; P 35928

Typhaceae
Typha latifolia L.: 1; M 2124

Erigenia, Number 21, November 2006, pp 22–24

Savanna Blazing Star, *Liatris scariosa* (L.) Willd. var. *nieuwlandii* Lunell, A New Record For DuPage County, Illinois

Paul Bollinger[1]

Abstract: Savanna blazing star (*Liatris scariosa* var. *nieuwlandii*) is an Illinois state threatened plant species which was recently identified in DuPage County, Illinois. One individual was observed in a wetland mitigation area adjacent to a remnant prairie within an undeveloped portion of an industrial park. The individual appears to be naturally occurring and not transplanted as part of restoration efforts for the wetland mitigation area.

Introduction

The Endangered Species Protection Board (2004) considers *Liatris scariosa* var. *nieuwlandii* an Illinois threatened plant species. According to Herkert (1991), Swink and Wilhelm (1994), Herkert and Ebinger (2002), and Mohlenbrock (2002), there are no known populations in DuPage County, with Cook and Will being the only northeastern Illinois Counties where it is found. According to Bowles et al (1988), most populations range in size from 1 to over 100 flowering individuals. According to Bell et al (1999), this species is restricted to current or former savanna habitats and is both spatially and temporally isolated from other populations of *Liatris scariosa* var. *nieuwlandii*. In addition, it appears to favor areas with relatively high amounts of bare ground. It grows either in partial shade of undisturbed savanna remnants or, which is the usual case in northeastern Illinois, in full sun of open disturbed habitat without tallgrass cover (Bowles et al 1988; Gleason & Cronquist 1991; Swink & Wilhelm 1994).

The purpose of this paper is to document the occurrence of savanna blazing star *Liatris scariosa* (L.) Willd. var. *nieuwlandii* Lunell, in DuPage County, Illinois. The plant was first identified in DuPage County, Illinois, by the author on September 9, 2003. It was observed the following year on July 20 and August 4, 2004. On September 8, 2004, Scott Kobal, Plant Ecologist with the Forest Preserve District of DuPage County, confirmed the occurrence. A specimen was not collected, as only one flowering individual was observed.

Species Description

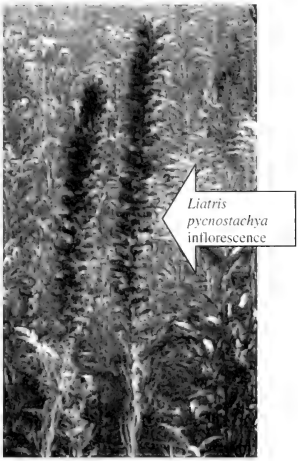
The following description of *Liatris scariosa* comes from Britton and Brown (1970).

> "Finely pubescent, at least above, 1–6 feet high. Lower leaves oblanceolate, spatulate or oblong-lanceolate, narrowed in a margined petiole, acute or obtusish at the apex, often 1 foot long and 1 ½ inch wide: upper leaves linear or linear-lanceolate, acute, or sometimes very obtuse, much smaller, all densely punctate: heads hemispheric, ½ inch–1 inch broad, 15–45- flowered, on stout peduncles 1/3 inch–2 inches long, or sometimes sessile; bracts of the involucre imbricated in 5 or 6 series, spatulate-linear, oblanceolate or obovate, rounded at the apex, appressed, their tips dry and scarious, often colored; flowers bluish purple; pappus barbellate."

According to Herkert (1991), this species was misidentified and treated as a hybrid in Illinois; now it is recognized at the varietal level. Therefore, we have included Swink and Wilhelm's (1994) description of *Liatris scariosa* var. *nieuwlandii* starting at the genus level.

> "Heads few to numerous, sessile to pedunculate, each with more than 15 flowers. Stems pubescent or glabrate; involucral bracts spreading or reflexed at the rounded tips; heads usually more than 20; corolla lobes glabrous; pappus merely barbellate. Middle involucral bracts non-bullate, glabrous, hirsutulous, or cinereous abaxially, uniformly narrow, with entire,

[1] Bollinger, Lach & Associates, 1010 Jorie Boulevard, Oak Brook, Illinois 60523.



Photos taken by Paul Bollinger.

slightly erose, or ciliate scarious margins; heads sessile to very often on peduncles as long as or longer than the involucres."

DESCRIPTION OF SPECIES LOCATION AND HABITAT

Geographically, the site is located in Section 5, Township 39 North, Range 9, East of the Third Principal Meridian. It is east of Kress Road and north of Downs Road in West Chicago, DuPage County, Illinois. The site is in an undeveloped portion of an industrial park about 1 km west of West Chicago Prairie, operated by the Forest Preserve District of DuPage County. The majority of the undeveloped area remains undisturbed and supports conservative prairie remnant species with large amounts of bare ground. Recently a portion of the site was disturbed and a wetland mitigation area with associated prairie buffer was created. The individual *Liatris scariosa* var. *nieuwlandii* was found on the fringe of the prairie buffer and the undisturbed prairie remnant. Associates included Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), ox-eyed daisy (*Chrysanthemum leucanthemum* var. *pinnatifidum*), yellow coneflower (*Ratibida pinnata*) and side-oats grama (*Bouteloua curtipendula*). Some of these species represent tallgrass species, which were planted and not usually associated with *Liatris scariosa* var. *nieuwlandii*. Prairie vegetation with high amounts of bare soil dominated the undisturbed area immediately to the east, which appears to be ideal habitat for this species.

The on-site individual of *Liatris scariosa* var. *nieuwlandii* appears to be naturally occurring and not accidentally introduced. The closest related species planted within the wetland mitigation prairie buffer was prairie blazing star (*Liatris pycnostachya*) and its inflorescences are distinct (see photos). In addition, the site was planted within one year of the author's first observation of the flowering individual of *Liatris scariosa* var. *nieuwlandii*, and *Liatris* spp. normally take more than one year to flower from seed. And lastly, the individual is growing less than 1 m from a habitat type that favors this species. Therefore, this individual appears to have always occurred on the site with recent native plantings occurring adjacent to it.

ACKNOWLEDGMENTS

I would like to thank Scott Kobal, Plant Ecologist with the Forest Preserve District of DuPage County, for confirming the species in the field and for comments on the manuscript.

LITERATURE CITED

Bell, T., M. Bowles, R. Hyerczyk, and J. McBride. 1999. Does management for tallgrass prairie inhibit Savanna Blazing Star persistence. A report to the Illinois Nature Preserves Commission and the Forest Preserve District of Will County, Illinois.

Bowles, M., G. Wilhelm, and S. Packard. 1988. The Illinois status of *Liatris scariosa* (L.) Willd. var. *nieuwlandii* Lunell a new threatened species for Illinois.

Britton, N. and A. Brown. 1970. An illustrated Flora of the Northern United States and Canada. Vol. III. Gentianaceae to Compositae. Dover Publications, Inc., New York, New York.

Gleason, H. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. 2nd ed. New York Botanical Garden, Bronx, New York.

Herkert, J. 1991. Endangered and threatened species of Illinois: Status and distribution. Volume 1 – Plants. Endangered Species Protection Board, Springfield, Illinois.

Herkert, J. and J. Ebinger. 2002. Endangered and threatened species of Illinois: Status and Distribution, Volume 1 – Plants. Illinois Endangered Species Protection Board, Springfield, Illinois.

Illinois Endangered Species Protection Board. 2004. Endangered and threatened species list. Illinois Endangered Species Protection Board. One Natural Resources Way, Springfield, Illinois 62702-1271. http://dnr.state.il.us/espb/datelist.htm

Mohlenbrock, R. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region. 4th ed. Indiana Academy of Science, Indianapolis, Indiana.

Erigenia, Number 21, November 2006, pp 25–31

The Black Snakeroot Species (*Sanicula* L., Apiaceae) of Illinois

Loy R. Phillippe[1], Daniel T. Busemeyer[1,2], and John E. Ebinger[1]

Abstract: A principal components analysis of 104 herbarium specimens representing the morphological and geographical range of *Sanicula* L. in Illinois revealed that the six native taxa are distinct (five species, one with two varieties). Of these taxa, *Sanicula canadensis* L. var. *canadensis* and *S. odorata* (Raf.) Pryer & Phillippe (*S. gregaria* Bickn.) are very common, being reported from most Illinois counties. Of the remaining taxa, *S. canadensis* L. var. *grandis* Fern. and *S. marilandica* L. are mostly restricted to the northern half of the state. *S. trifoliata* Bickn. is uncommon, but scattered throughout the state (found in 13 counties), while the extremely rare *S. smallii* Bickn. is known from only Hardin County in extreme southern Illinois.

Introduction

Sanicula (Apiaceae), commonly known as black snakeroot or sanicle, is distributed primarily in the north temperate zone of both the Old World and New World. In eastern United States, this genus of mostly perennial herbs is found in mesic woodlands where it is commonly a major component of the flora. Approximately 40 species are found worldwide, with five species occurring in eastern North America (Gleason and Cronquist 1991). Members of *Sanicula* are readily distinguished from other genera of the Apiaceae by their swollen fruits that have hooked bristles, and the fruits in three flowered umbellets.

The genus is characterized by the following morphological features: herbaceous perennials from a cluster of fibrous to fleshy-fibrous roots; basal leaves with the petioles longer than the palmately compound blades with variously lobed leaflets; the cauline leaves similar, but smaller with shorter petiole, and progressively reduced upward; flowers small, 5-merous, epigynous, gamosepalous, polypetalous with the petals apically inflexed, and grouped into an umbellet; the simple to compound umbels bearing a mixture of hemaphrodite and staminate flowers; and fruits which have four prominent and persistent calyx lobes, numerous hooked bristles over the entire outer surface, and two persistent styles.

The genus *Sanicula* is commonly placed in the tribe Saniculeae of the subfamily Saniculoideae, which also includes the closely related genus *Eryngium* L. (Plunkett et al. 1996, Downie et al. 1998). Shan and Constance (1951) recognized five sections within the genus *Sanicula*, each with its distinct morphological characteristics and distinctive geographical range. Only one section (*Sanicula*) occurs in eastern North America. Phillippe (1978a) distinguished seven New World taxa within section *Sanicula*. Six of these occur in eastern North America, and one is known from the mountains of Mexico and Central and South America (Pryer and Phillippe 1989). Of these taxa, both Jones (1963) and Mohlenbrock (1986) recognized that four taxa occur in Illinois. Recent evaluation of the Illinois specimens, however, indicates that six taxa are present in Illinois (Mohlenbrock 2002). The present study was undertaken to examine the relationships among the *Sanicula* species found in Illinois, to determine their geographical distribution in the state, and to distinguish any subspecific taxa.

Materials and Methods

More than 1,000 herbarium specimens were examined from many of the state herbaria (DEK, EIU, F, ILL, ILLS, MOR, MWI, SIU). Habitat observations also were made for most species, and specimens were collected. From this material, dot maps were prepared. Each dot on the resulting maps represents a specimen seen by the authors (Figures 2,3). The specimens were sorted into groups based on similarity of morphological characteristics. After removal of duplicate specimens and specimens without adequate diagnostic

[1] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Champaign, Illinois 61820.
[2] Present address: Ghost Pine Environmental Services, Ltd., Calgary, Alberta, Canada T2Z 1M9.

Table 1: Characters scored for the principal components analysis of the *Sanicula* taxa of Eastern North America.

FrL	1.	Fruit length, including stipe and calyx (mm);
FrC	2.	Fruit calyx length (mm);
FrS	3.	Fruit stipe length (1 = present and mostly more than 0.5 mm long, 2 = fruit sessile to subsessile);
FrA	4.	Fruit calyx-lobe shape (1 = subulate, 2 = acute to obtuse);
StL	5.	Fruit style length (1 = shorter than calyx, 2 = up to twice as long as calyx, 3 = more than twice as long as calyx);
Com	6.	Commissural scar shape (1 = narrowly elliptical to oblong, 2 = broadly oval);
ScL	7.	Staminate flower calyx length (mm);
ScS	8.	Staminate flower calyx-lobe shape (1 = subulate, 2 = acute to obtuse);
StN	9.	Number of staminate flowers per umbellet (1 = 8 or less, 2 = more than 8, and usually 15 or more);
StP	10.	Staminate flower pedicel length (mm);
Rot	11.	Root shape (1 = fibrous, 2 = thickened and cord-like).

features, a group of specimens representing the range in morphological characteristics and the geographical distribution of each taxon in Illinois was selected for further study. From this group, a total of 104 specimens were scored for 1 vegetative and 10 floral and fruit characters (Table 1). For the common Illinois taxa, *Sanicula canadensis* var. *canadensis* and *S. odorata* (*S. gregaria*), only 33 specimens were selected for each taxon. For the other taxa, all available, good quality specimens were used. For *S. smallii*, two out-

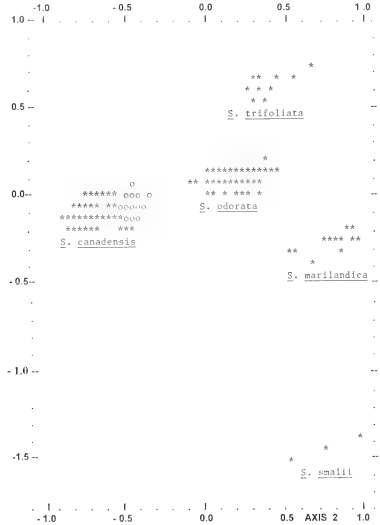


Figure 1. A two-dimensional plot (axis 2 vs. axis 3) of a principal component analysis using 11 variables for 33 specimens of *Sanicula canadensis* var. *canadensis* (*), 13 specimens of *S. canadensis* var. *grandis* (o), 12 specimens of *S. marilandica*, 33 specimens of *S. odorata*, 10 specimens of *S. trifoliata*, and 3 specimens of *S. smallii*.

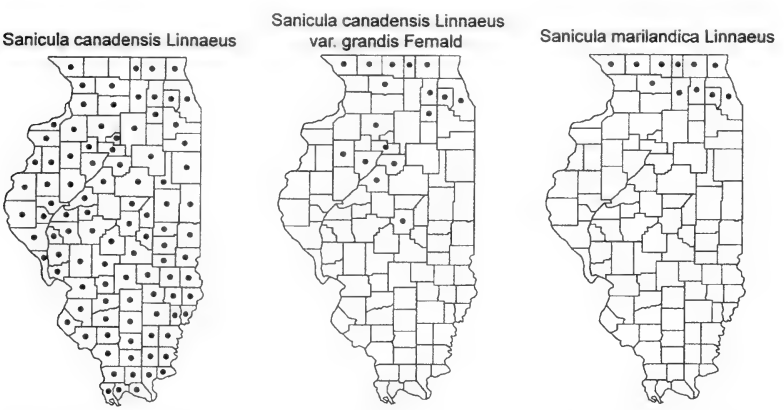


Figure 2. Illinois distribution of *Sanicula canadensis* var. *canadensis*, *S. canadensis* var. *grandis*, and *S. marilandica*.

of-state specimens were included in the analysis. All characters were measured (three or more measurements for each specimen) and plotted to insure that gaps exist to enable the use of scored characters. Such differences were observed in all cases. The data were then analyzed by principal-components analysis (PCA) using NTSYS-pc (Rohlf 1990).

RESULTS AND DISCUSSION

When the PCA of the entire data set for the 104 specimens was run, the first three principal components accounted for 53%, 24%, and 11%, respectively, or 88% of the total variance. Fruit calyx length, fruit length, and staminate flower calyx-lobe length (characters 2, 1, and 8) were the most important in determining the score of the first component. The number of staminate flowers per umbellet, fruit style length, and the staminate flower pedicel length (characters 9, 5, and 10) were the most important in determining the score of the second component. Root shape and commissural scar shape (characters 11 and 6) were the most important in distinguishing the third component.

Three two dimensional plots (axis 1 vs. 2, 2 vs. 3, and 1 vs. 3) were obtained from the PCA, with the plot using axis 2 vs. axis 3 giving the best resolution (Figure 1). On this PCA plot, five distinct clusters can be recognized that correspond to the five native Illinois species (Figure 1). The clusters are well separated from each other. Also, the dots representing the specimens in each group are mostly closely spaced, indicating that the species are fairly homogeneous, and that gene flow between these species is probably not occurring.

The cluster in Figure 1 that represents *Sanicula canadensis* includes individuals of both variety *canadensis* and variety *grandis*. Most of the individuals on the left side represent variety *canadensis*; those on the right, variety *grandis*. These taxa are very similar morphologically, but the length of the fruiting style can be used for consistent separation, the styles in variety *canadensis* being shorter than the fruiting calyx, those of variety *grandis* being about twice as long as the fruiting calyx.

Key to the Illinois species of *Sanicula*.

1. Styles much longer than the calyx lobes (1.5–3× longer) and longer than the bristles of the fruit, strongly recurved; staminate flowers 10 to 25 or more in some umbellets.
   2. Calyx lobes on the mature fruit 0.9–2.0 mm long; sepals of the staminate flowers acuminate to subulate, sharp-pointed, 0.7–1.5 mm long.
      3. Fruits with short, but distinct, pedicels 0.8–1.5 mm long; staminate flowers 3 to

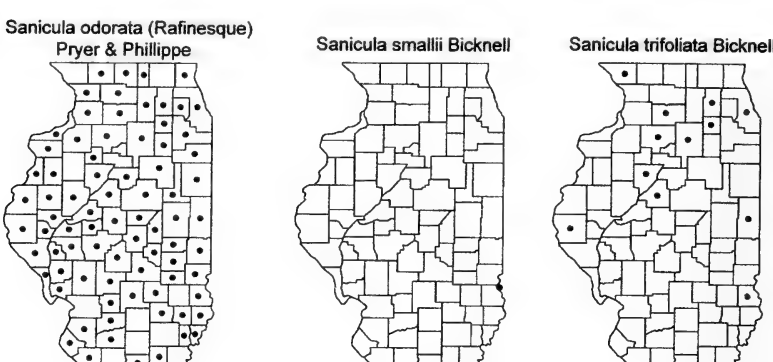


Figure 3. Illinois distribution of *Sanicula odorata*, *S. smallii*, and *S. trifoliata*.

15, many not persisting, shorter than the fruits . . . . . 1b. *Sanicula canadensis* var. *grandis*

3. Fruits sessile to subsessile; staminate flowers commonly 12 to 25 or more in each umbellet, many persistent and surpassing the fruits . . . . . 2. *Sanicula marilandica*

2. Calyx lobes on the mature fruit 0.3–0.7 mm long; sepals of the staminate flower deltoid, the apices obtuse to acute, not sharp-pointed, less than 0.5 mm long . . . . . 3. *Sanicula odorata*

1. Styles shorter to slightly longer than the calyx lobes and shorter than the bristles of the fruit, not recurved; staminate flowers 2–11 per umbellet.

4. Calyx of fruit connivent, beak-like, exceeding the bristles of the fruits; pedicels of the staminate flowers 3–6 mm long . . . . . 5. *Sanicula trifoliata*

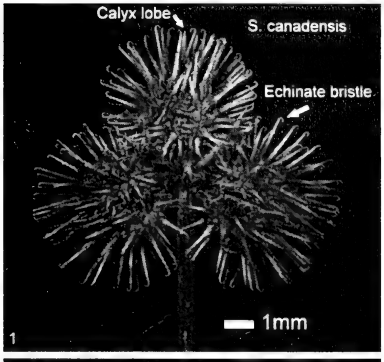
4. Calyx of fruit not connivent, somewhat spreading in fruit, not exceeding the bristles of the fruit; pedicels of the staminate flowers mostly less than 3 mm long.

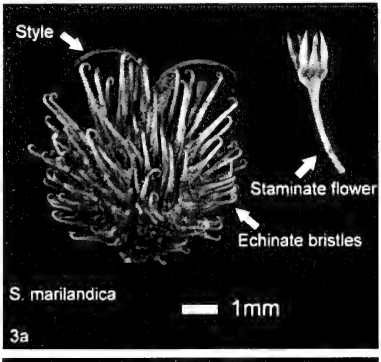
5. Roots mostly thickened and cord-like; fruits sessile or subsessile; styles equaling or slightly exceeding the fruiting calyx (Hardin Co.) . . . . 4. *Sanicula smallii*

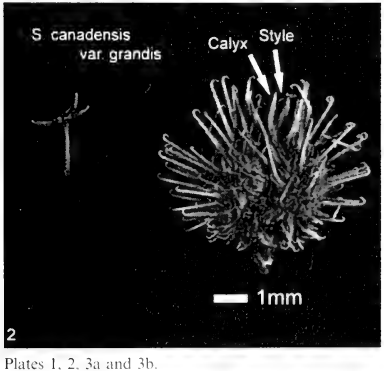
5. Roots fibrous; fruits with a short, but distinct pedicel 0.8–1.5 mm; styles shorter than the fruiting calyx . . . . . 1a. *Sanicula canadensis* var. *canadensis*

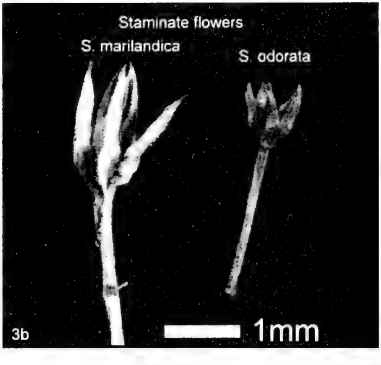
1a. *Sanicula canadensis* L. var. *canadensis* (short-styled Canadian black snakeroot) (Plate 1)

In Illinois, this taxon is extremely common, being reported from all but four counties, and undoubtedly occurs in those (Figure 2). This taxon is abundant in Illinois, occurring in such varied habitats as dry to mesic upland woods, wet lowland woods, thickets and sometimes disturbed habitats. Not uncommonly, it occurs with other *Sanicula* species, particularly *S. odorata* (*S. gregaria*). Specimens of this taxon are occasionally misidentified as *S. odorata*, as they are superficially similar and commonly occur in the same habitat. The larger staminate flowers of *S. canadensis* that have acuminate, sharp-pointed sepals allow for consistent separation from *S. odorata*, in which the smaller staminate flowers have deltoid sepals with obtuse apices. Also, in *S. canadensis* var. *canadensis*, the styles are shorter than the bristles on the fruit, while in *S. odorata*, the styles are much longer than the bristles. In North America, this species ranges from the Great Lakes to southern Vermont and Massachusetts south to central Florida and west to South Dakota and central Texas (Pryer and Phillippe 1989).





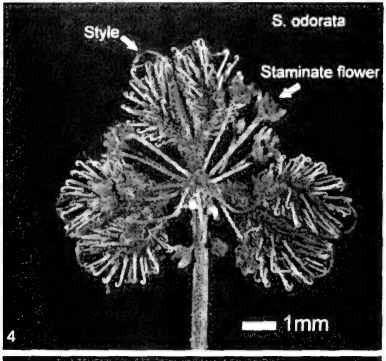


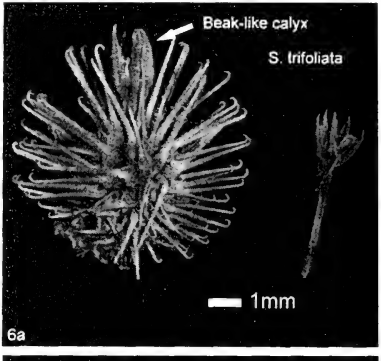


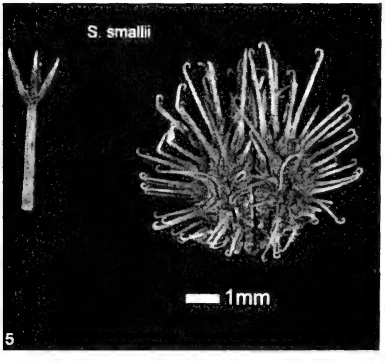
Plates 1, 2, 3a and 3b.

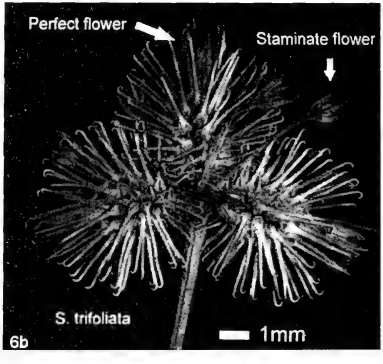
1b. *Sanicula canadensis* L. var. *grandis* Fern. (long-styled Canadian black snakeroot) (Plate 2)

This taxon is scattered and local in Illinois, usually being found in moist, rich woods. Fairly common in the northern one-third of Illinois where numerous specimens were collected, this taxon is occasionally found as far south as Macon and Tazewell counties (Figure 2). Fernald (1940) described *S. canadensis* var. *grandis* on the basis of plants with leaves larger than in var. *canadensis*. However, the fruit length, fruit width, and the style length are significantly larger in var. *grandis* than in var. *canadensis* (Pryer and Phillippe 1989). Jones (1963), Mohlenbrock (1986) and Gleason and Cronquist (1991) did not recognize this taxon. However, the reliable morphological characteristics, particularly the elongated styles, indicate that this is a valid variety. Mohlenbrock (2002) recognized this variety in his recent Illinois flora. This entity has a distinct geographical range, extending from Vermont south to northern Kentucky and west and north to Iowa, Minnesota and Wisconsin (Pryer and Phillippe (1989). Phillippe (1978a) determined that this taxon does not have a hybrid origin, since interspecific cross-pollination experiments between the possible parents did not result in seed development, and pollen stainability was very high (98%) in var. *grandis*.









Plates 4, 5, 6a and 6b.

2. *Sanicula marilandica* L. (black snakeroot) (Plates 3a, 3b)

A fairly common species of northern Illinois, this taxon is found in dense mesic woods, wooded ravines and hazel thickets, occasional in more open, disturbed sites and rarely in prairies. Of the numerous specimens examined that were labeled *S. marilandica*, the authors found no collections of this taxon farther south than DeKalb and DuPage counties (Figure 2). The central and southern Illinois occurrences of this taxon reported by Mohlenbrock and Ladd (1990) are probably based on specimens of *S. canadensis* and *S. odorata*. The sessile to subsessile fruits, the subulate, sharp-pointed sepals, and the large number of staminate flowers in the umbellets (12 to 25), separates *S. marilandica* from the other sanicles of Illinois. This wide-ranging species occurs from Maine to Florida, west to Washington, south in the mountains to New Mexico, and throughout most of southern Canada (Pryer and Phillippe 1989).

3. *Sanicula odorata* (Raf.) Pryer & Phillippe (common black snakeroot) (Plates 3b, 4)

This is probably the most commonly encountered species of sanicle in Illinois, being abundant in moist upland and lowland woods and thickets, and commonly associated with streams and seepage areas. It is known from most Illinois counties (Figure 3) and

undoubtedly occurs in all of them. From the herbarium records examined by the authors, only 14 counties have not been recorded for this species. It is most often confused with *S. marilandica*, from which it may be distinguished by the smaller deltoid calyx lobes (0.3–0.7 mm long) of *S. odorata* compared to the larger, sharp-pointed calyx lobes (0.7–1.5 mm long) of *S. marilandica*. In the past, this taxon has been referred to as *S. gregaria* Bicknell, and most modern authors have used that name for this entity. Phillippe (1978a, 1978b) and later Pryer and Phillippe (1989) recognized that an earlier name, *Triclinum odoratus*, was used by Rafinesque (1817) for this taxon. The combination, *Sanicula odorata* (Raf.) Pryer and Phillippe, was officially made in 1989. In North America, this taxon is found from Maine, south to northern Florida, west to central Texas and eastern North Dakota, its northern boundary being the Great Lakes region (Pryer and Phillippe 1989).

4. *Sanicula smallii* Bickn. (southern black snakeroot) (Plate 5)

Extremely rare in Illinois, this taxon is known in the state from only one collection; it was found in a dry-mesic upland forest in Hardin County (Basinger 11370, ILLS) (Figure 3). First collected in Illinois in 1998, this species occurs primarily in the southeastern United States, and is not known to occur farther north than Kentucky, southern West Virginia, and southern Illinois. Most similar to *S. canadensis*, this taxon is easily separated from that species by its thickened cord-like roots, sessile to subsessile fruits, and styles that are slightly longer than the calyx.

5. *Sanicula trifoliata* Bickn. (large-fruited black snakeroot) (Plates 6a, 6b)

Scattered and rare in Illinois, *S. trifoliata* has only rarely been collected in the state. The authors have seen fewer than 15 collections. Usually associated with mesic, rich woods, *S. trifoliata* is only known from 13 Illinois counties (Figure 3). The authors have seen only one collection from most of these counties. It is a very distinctive species. The large fruits in which the beak-like connivent calyx lobes exceed the fruiting bristles and the long pedicelled staminate flowers make identification easy. It is found throughout north-central North America from the Great Lakes region and New Hampshire, west to southeastern Minnesota, and south to northern Alabama and Georgia in the Appalachians (Pryer and Phillippe 1989).

ACKNOWLEDGMENTS

The authors would like to thank the curators of the many herbaria that loaned herbarium material, as well as those that provided facilities for examining specimens. We gratefully acknowledge the help of Dr. Jason Koontz and Dr. Kenneth Robertson of the Illinois Natural History Survey, Champaign, Illinois, for reviewing the manuscript, and to William McClain, recently retired from the Illinois Department of Natural Resources, for his helpful suggestions.

LITERATURE CITED

Downie, S. R., S. Ramanath, D. S. Katz-Downie, and E. Llanas. 1998. Molecular systematics of Apiaceae, subfamily Apioideae: phylogenetic analyses of nuclear ribosomal DNA internal transcribed spacer and plastid rpoC1 intron sequences. American Journal of Botany 85:563–591.

Fernald, M. L. 1940. A century of additions to the flora of Virginia. Rhodora 42:466–470.

Gleason, H. A. and A. Cronquist. 1991. Manual of the Vascular Flora of Northeastern United States and Adjacent Canada. 2nd ed. The New York Botanical Garden, Bronx, New York.

Jones, G. N. 1963. Flora of Illinois. 3rd ed. American Midland Naturalist Monograph No. 7. The University of Notre Dame Press, Notre Dame, Indiana.

Mohlenbrock, R. H. 1986. Guide to the Vascular Flora of Illinois, revised and enlarged edition. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Mohlenbrock, R. H. 2002. Vascular Flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois vascular plants. Southern Illinois University Press, Carbondale, Illinois.

Phillippe, L. R. 1978a. A biosystematic study of *Sanicula* section *Sanicula*. Ph.D. thesis, University of Tennessee, Knoxville, Tennessee.

Phillippe, L. R. 1978b. *Sanicula odorata* (Raf.) Phillippe, comb. nov. (Umbelliferae). Association of Southeastern Biologists Bulletin 25(2):75. (abstract)

Plunkett, G. M., D. E. Soltis, and P. S. Soltis. 1996. Evolutionary patterns in Apiaceae: inferences based on matK sequence data. Systematic Botany 21:477–495.

Pryer, K. M. and L. R. Phillippe. 1989. A synopsis of the genus *Sanicula* (Apiaceae) in eastern Canada. Canadian Journal of Botany 67:694–707.

Rafinesque, C. S. 1817. Florula ludoviciana: or, a flora of the state of Louisiana. C. Wiley & Co., New York, New York.

Rohlf, F. J. 1990. NTSYS-pc. Numerical and multivariate analysis system, version 1.50. Exeter Software, Setauker, New York.

Shan, R. H. and L. Constance. 1951. The genus *Sanicula* (Umbelliferae) in the Old World and the New. University of California Publications in Botany 25(1):1–78.

Erigenia, Number 21, November 2006, pp 32–39

Survey of the Illinois Endangered Kankakee Mallow, *Iliamna remota* (Greene), in Kankakee County

April L. McDonnell[1,3], Henry R. Owen[2,3], Sean C. Jones[3], Vincent P. Gutowski[3], and John E. Ebinger[4]

Abstract: *Iliamna remota* Greene (Malvaceae), endemic only to Langham Island in the Kankakee River, Kankakee County, Illinois, is a state endangered species. During the present study, the size of the population was determined, the habitat structure in and around the individual colonies analyzed, and management recommendation made to potentially increase the size of the population. During the summer of 2005, the *I. remota* population consisted of 1,074 stems in 12 colonies, located along the northwest side of the island. In late June, flowering appeared to be prolific, where means and standard deviations of floral buds and open flowers were 1.6 ± 1.2 and 2.1 ± 1.7 per stem, respectively. By late July, however, flowering was sporadic, but many flowering stems had set seed with the mean number of fruits being 1.2 ± 0.9 per stem. Forty percent of sampled seeds germinated after being treated in hot water (80°C) for 10 seconds. Common species associated with *I. remota* colonies were the cool-season Eurasian grass, *Poa pratensis*, and the East Asian shrub *Lonicera maackii*, along with 22 native species and a few other exotics. Previous management included cutting and burning of the shrubby vegetation in and around the *I. remota* colonies. A return to these management practices is suggested.

Introduction

Iliamna remota Greene (Malvaceae) is an endangered species that is endemic to Langham Island in the Kankakee River, Kankakee County, Illinois (Herkert and Ebinger, 2002). This island, owned by the Illinois Department of Natural Resources, was dedicated as the Kankakee River Nature Preserve in 1966 to preserve the only known native population of *I. remota* (McFall and Karnes, 1995). In 1980, the Illinois Endangered Species Protection Board declared *I. remota* as endangered in Illinois because of its limited range (Schwegman, 1984). Some taxonomical debates exist about this species classification. However, Edward Lee Greene classified *I. remota* as specifically distinct from *I. rivularis* in 1906, based upon morphological differences of the calyx-lobes and carpels (Rydberg, 1913; Strausbaugh and Core, 1932; Wiggins, 1936). More recently, a study resolving the phylogeny of *Iliamna* species found *I. remota* to be genetically distinct from *I. rivularis* at the internal transcribed spacer region in the nuclear ribosomal RNA subunits (Bodo Slotta, 2000). Another taxonomical debate exists over whether *I. remota* is the same species as its closely related eastern occurring species, *I. corei* (Sherff) Sherff (Sherff, 1949). Resolution with regards to *I. remota* and *I. corei* species classification was attempted using the internal transcribed spacer regions in the nuclear ribosomal RNA subunits of both species, without clear results (Bodo Slotta, 2000). The name *Iliamna remota* is recognized in this study from *I. rivularis* and *I. corei* in response to different morphological characters documented by Greene (Strausbaugh and Core, 1932) and Sherff (Sherff, 1949).

Iliamna remota is an herbaceous, perennial species that typically grows in sunny, open habitats near the shore along the northwestern portion of Langham Island (Glass et al., 2003; Schwegman, 1984). Plants are 1.0 to 2.5 m tall, with coarse hairs covering the stems and leaves. The palmately-lobed leaves are alternate along the stem, and the flowers occur in terminal racemes. Roots of *I. remota* are shallow and densely fibrous, and vegetative reproduction readily occurs from root crowns of older plants. Two to eight stems may arise from one root crown. Flowers range

[1] (217) 581–3126, april_mcdonnell@yahoo.com
[2] (217) 581–6238, hrowen@eiu.edu
[3] Eastern Illinois University, 600 Lincoln Avenue, Charleston, Illinois 61920.
[4] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Charleston, Illinois 61820.

from white to lavender. Fruits are capsules that usually release seeds by the end of September. Previous reports indicate that seedling establishment occurs in March and flowering occurs from July through August (Glass et al., 2003; Schwegman, 1984).

Iliamna remota was first documented from Altorf (Langham) Island by E. J. Hill on June 29, 1872, which he noted was close to the small village of Altorf (Strausbaugh and Core, 1932; Sherff, 1946; Jones, 1952). Hill reported that most of the *I. remota* plants grew in habitats such as "gravelly" and "dry banks" (Schwegman, 1988). According to Schwegman (1984), an unpublished class report, written by B. Peyton of Westview High School in Kankakee, Illinois in 1973, measured and plotted all major colonies of *I. remota* on Langham Island. The population was more or less continuous for approximately 200 m along the northwest edge of the island, where plants were observed to occur from halfway up the slope from the shore of the island to 7 m inland. In 1981, about 109 flowering stems were counted in one colony. In 1983, the number of flowering stems declined to 49 in the same colony, and the population consisted of a total of 180 stems concentrated in five colonies (Schwegman, 1984).

Schwegman (1984) prepared a recovery plan to ensure that the *Iliamna remota* population would not become extinct at its only native location. The recovery plan recommendations included: mechanical and chemical eradication of invasive, woody shrubs, namely *Lonicera maackii*, to reduce shading; controlled burns to maintain the open environment optimal for *I. remota* growth and development, and a yearly survey of plants including direct counts of flowering and vegetative stems and seedlings. Since 1984, the portion of the island where *I. remota* occurred was managed according to the recovery plan and the population was monitored for the next 19 years. During this time, *Lonicera maackii* was chemically treated with foliar sprays of Roundup® (2-[phosphonomethylamino] acetic acid), while dense stands were mechanically removed and stems were treated with Garlon 4 herbicide (3,5,6-trichloro-2-pyridinoxyacetic acid; Glass et al., 2003). In April 2001, many shrubs and small trees were mechanically removed and stacked into brush piles in eighteen areas within the *I. remota* population (Figure 1). Seedlings were counted at every brush pile position two months after the piles were burned. Table 1 illustrates where brush pile positions occurred (using a Trimble GeoExplorer III unit) and correlating seedling number. Seedling number reached 3,500 in one area after brush was burned, indicating the effectiveness of burning on seedling development. Data from this 19-year study showed that there was an overall increase in population size from 180 stems in 1983 to 1,646 stems in 2002, with the largest number of stems (5,364) occurring in 2001, when the brush piles were burned (Glass et al., 2003).

The recent lack of management poses a potential threat to the *Iliamna remota* population. The last controlled burn was conducted in 2003, and the interior of the island did not burn well due to high moisture levels (Kirk, pers. comm.). Since 2003, burns and invasive species control have not been conducted on the island. The objectives of this study were to estimate the current population size and status of *I. remota* on Langham Island, and to obtain data useful for the continued management of this species.

DESCRIPTION OF STUDY AREA

Kankakee River Nature Preserve is located in the Kankakee River about 10 km northwestern of downtown Kankakee, Kankakee County, Illinois (N1/2 S9 T31N R11E). The preserve consists of approximately 56 ha in three separate tracts, Langham Island, and forested shorelines on both sides of the river at the western most edge of Kankakee River State Park (McFall and Karnes, 1995). The island is about 700 m long by 195 m wide, and about 10.1 ha in size (Schwegman, 1991). The interior of the island is very flat with little variation in elevation, while steep slopes 2–4 m high separate the upland from the narrow shoreline.

The earliest known report on the vegetation of Langham Island was in 1834 when a government surveyor described the south shore as being "high level rich prairie" with scattered trees of bur oak (*Quercus macrocarpa*), white oak (*Q. alba*) and hickories (*Carya* spp.). By 1912, the elevated, flat portion of the island was cleared and used for row crops. At that time, *Iliamna remota* plants were noted to be "numerous" on the island and located from the edges of the crop field down the slopes of the island leading to the river. In 1945, cultivation ceased and the *I. remota* population consisted of "hundreds of plants," with most plants inhabiting the island's "marginal rocky, grassy slope[s]" (Sherff, 1946). Soon exotic grasses, such as *Poa pratensis* and *P. compressa*, dominated where the cultivated field had been (Glass et al., 2003; Schwegman, 1984, 1991). Other herbaceous species observed in the old field were *Melilotus albus* and *Solidago canadensis*. Woody species such as *Quercus macrocarpa*, *Fraxinus quadrangulata*, and *Toxicodendron radicans* were observed along the south slope of the island (Schwegman, 1988, 1991).

Both Sogan and Rockton Loam soils occur on the island (Paschke, 1979). The Sogan Loam occurs along the steep slopes (18–30%) around the edge of the island where *Iliamna remota* is common. This well-drained, loamy soil commonly contains gravel deposits that increase drainage. The soils of the nearly flat uplands are Rockton Loam. This soil is typically 22.5 cm thick

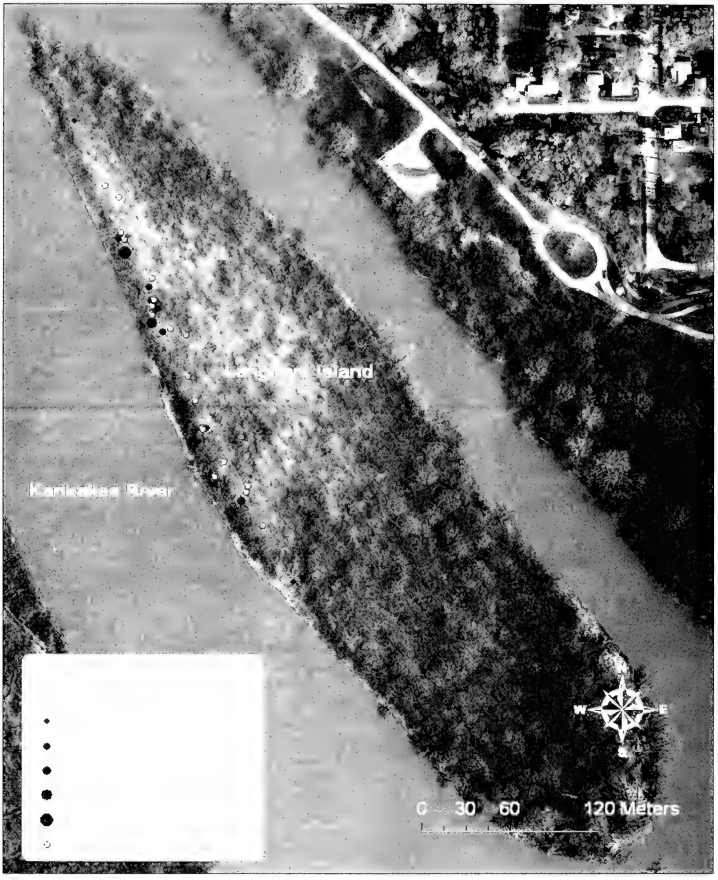


Figure 1: Colony positions and stem numbers of *I. remota* in 2005 and brushfire pile positions in 2001. Stem numbers classified on a Jenks scale. Colony and brushfire pile positions based on the Illinois State Plane East Zone (FIPS 1201) coordinate system and map (NAD 1983) courtesy of Kankakee County GIS specialist, Roger Diercks.

Table 1: *Iliamna remota* brushfire pile positions and correlating seedling number determined from a previous study headed by W. Glass (Glass et al., 2003).

2001

Colony #	Latitude	Longitude	Seedling number
1	41°11′21.371″N	87°57′58.436″W	51
2	41°11′21.861″N	87°57′58.547″W	11
3	41°11′22.719″N	87°57′59.275″W	20
4	41°11′22.890″N	87°57′59.387″W	15
5	41°11′23.661″N	87°57′59.446″W	15
6	41°11′23.939″N	87°57′59.839″W	20
7	41°11′21.243″N	87°57′58.495″W	160
8	41°11′21.040″N	87°57′58.495″W	20
9	41°11′20.721″N	87°57′57.980″W	91
10	41°11′20.598″N	87°57′57.518″W	58
11	41°11′19.660″N	87°57′57.460″W	245
12	41°11′19.124″N	87°57′57.264″W	128
13	41°11′18.469″N	87°57′57.061″W	187
14	41°11′17.748″N	87°57′56.448″W	10
15	41°11′17.210″N	87°57′55.749″W	222
16	41°11′17.059″N	87°57′55.806″W	3500
17	41°11′16.327″N	87°57′55.342″W	70
18	41°11′16.420″N	87°57′56.715″W	2
		Total:	4825

over the dolomite bedrock, and has a moderate water-holding capacity. *Iliamna remota* also occurs in this uplands soil, which has a 0–2% slope (Schwegman, 1984).

MATERIALS AND METHODS

The *Iliamna remota* population on Langham Island was surveyed during early summer of 2005 and the number of stems determined for the colonies encountered (Table 2). A GPS unit (Trimble Pro XRS) was used to mark the position of each colony. The population extent was defined as the northernmost and southernmost *I. remota* positions. Twelve colonies of *I. remota* were located along the northwest edge of the island and colony positions were overlaid onto a high-resolution aerial photograph of Langham

Table 2: *Iliamna remota* colony positions and stem numbers found during this survey. Coordinates based on the Illinois State Plane East Zone (FIPS 1201).

2005

Colony #	X coordinates	Y coordinates	Stem number
1	1085596.24188	1646751.65769	8
2	1085511.18926	1646810.69330	13
3	1085481.68734	1646935.01594	75
4	1085405.33189	1647100.66349	12
5	1085309.74929	1647318.07209	12
6	1085283.67252	1647338.38232	231
7	1085292.66288	1647371.17920	78
8	1085283.99328	1647388.56829	68
9	1085278.51029	1647420.42367	26
10	1085224.79993	1647497.58760	450
11	1085212.73024	1647530.60695	100
12	1085114.54694	1647796.01309	1
		Total:	1074

Island (Figure 1). In Figure 1, the colony position points were formatted to increase in size to illustrate the stem numbers for each colony. Also, the position of the brush piles burned in 2001 is shown on this map (Glass et al., 2003). Position coordinates were based on the Illinois State Plane East Zone (FIPS 1201) global positioning coordinate system. In late July of 2005, the plant species encountered in and at the edge of colonies 2 through 11 was recorded. Nomenclature follows Mohlenbrock (2002).

Means and standard deviations of flower buds and open flowers were determined from ten colonies that were observed in June. Mean and standard deviation of fruits per stem were calculated based on a random choice of three stems from six colonies observed in July. Fruits were randomly collected in six colonies for germination experiments, and stored at room temperature (approx. 22°C) until tested for viability. Twenty-five seeds from four stems from one of the colonies were treated with a 10 second hot water dip (80°C) to break dormancy (Hilscher and Preece, 1994) and planted in cell packs containing Jiffy® soilless potting mix to test for viability based on the number of seeds germinated.

RESULTS

The *Iliamna remota* population extended as almost a straight line 350 m long on the slope and adjacent upland on the northwest side of Langham Island (Figure 1). The population was nearly continuous within this area with concentrated areas recorded as colonies in order to estimate population size. The larger colonies were estimated to be 5×7 m and up to 9×10 m, with most of the colonies much smaller. The number of stems ranged from 1 to 450 per colony, while the total number of individual stems encountered was 1,074. The position coordinates with the stem numbers for each colony are shown in Table 2.

In late June 2005, abundant open flowers and flower buds were observed in all colonies. The mean numbers and standard deviations of flower buds and open flowers were 1.6 ± 1.2 and 2.1 ± 1.7 per stems, respectively. By late July, flowering was sporadic throughout the population, and many flowers had set seed with mean numbers of fruits being 1.2 ± 0.9 per stem. The number of seeds per fruit ranged from 21 to 55 with an average of 44.2. After seeds were treated with hot water, germination occurred in seven days. True leaves were first observed on seedlings after 15 days. Ten of the 25 seeds (40%) germinated after 34 days.

Twenty-eight vascular plant species were observed growing in and at the edge of the *Iliamna remota* colonies. Of these, 78% were native species, and 25% were woody species (Table 3). The common native herbaceous species were *Carex* spp., *Elymus villosus*, *Oxalis stricta*, and *Solidago canadensis*, occurring in at least 60% of the colonies. Among the herbaceous non-native species, only *Poa pratensis* was common, being associated with all colonies, while the introduced woody shrub, *Lonicera maackii*, was common throughout the island and found in 90% of the colonies. Two native woody species, *Cercis canadensis* and *Toxicodendron radicans*, were common, being found in 80% of the colonies (Table 3). Overall, 15 species occurred in three or fewer colonies, and eight species were found in eight or more colonies.

DISCUSSION

During past and present surveys, the *Iliamna remota* plants were mostly restricted to open areas along the northwest portion of Langham Island, especially on the slopes (Sherff, 1946; Schwegman, 1984). When the population was severely limited (less than 100 plants), the range was reduced to the midwest portion of the island (Schwegman, 1984). After a controlled burn in 1986, the population re-established its original range as described by Sherff (1946) (Schwegman and Glass, 1986).

The species' range may be limited to the middle to northwestern portion of the island on the southwest-facing slope due to the more open habitat (Glass et al., 2003). Presently, the population appeared to contain concentrated colonies with isolated individuals scattered in between. The population appears to be more like the population observed in 1973, where stems were more or less continuous within the population (Schwegman, 1984). The population still appears to occur mostly on and near the peripheral slopes of the island. More plants were observed in full sun, whereas plants in shaded or partially shaded areas were shorter and tended to lack flowers and fruits.

The total length of the population (350 m) found in this study was close to the population length (366 m) observed in 1984. The number of stems (1,074) found in this survey exceeded that of the total number of stems (180) found in 1984. However, the stem number determined in this study was a low estimate because the estimated number of plants was derived from the more "concentrated" *Iliamna remota* colonies, whereas there were some isolated individuals scattered in between colonies, thus the population was more or less continuous, as noted in 1973. Therefore, the number of total stems found in this study is conservative.

The results of a controlled burn conducted on March 25, 1986, showed that burning was effective in seedling establishment and development. At that time, the controlled burn was conducted on nine of the ten known colonies of *Iliamna remota*. One colony remained unburned at the request of the Endangered

Table 3: Vascular plant species found within and at the edge of colonies of *Iliamna remota*.

	Colonies										% of colonies where species occurs
	2	3	4	5	6	7	8	9	10	11	
Herbaceous species											
Native											
Ageratina altissima (L.) R. M. King & H. Robins.				X	X	X					30
Asclepias syriaca L.								X			10
Carex L. spp.			X	X	X	X	X	X	X	X	80
Elymus villosus Muhl.		X	X	X	X	X	X	X	X	X	90
Elymus virginicus L.									X		10
Erigeron annuus (L.) Pers.						X				X	20
Geum canadense Jacq.				X	X	X					30
Hypericum sphaerocarpum Michx.	X			X							20
Muhlenbergia frondosa (Poir.) Fern.	X		X			X					30
Oxalis stricta L.			X	X	X	X	X	X	X	X	80
Penstemon digitalis Nutt.				X		X					20
Phalaris arundinacea L.		X	X			X				X	40
Solidago canadensis L.			X	X	X	X	X	X	X	X	80
Teucrium canadense L.		X							X	X	30
Verbesina helianthoides Michx.				X	X	X				X	40
Viola pratincola Greene			X								10
Non-native											
Achillea millefolium L.	X										10
Asparagus officinalis L.								X			10
Melilotus albus Medic.							X	X		X	30
Poa pratensis L.	X	X	X	X	X	X	X	X	X	X	100
Torilis japonica (Houtt.) DC.						X					10
Woody species											
Native											
Cercis canadensis L.			X	X	X	X	X	X	X	X	80
Parthenocissus quinquefolia (L.) Planch.							X			X	20
Ptelea trifoliata L.	X				X	X				X	40
Rubus occidentalis L.			X			X	X	X	X	X	50
Smilax tamnoides L.		X		X	X	X	X	X		X	70
Toxicodendron radicans (L.) Kuntze.			X	X	X	X	X	X	X	X	80
Non-native											
Lonicera maackii (Rupr.) Maxim.	X	X	X		X	X	X	X	X	X	90

Species Protection Board. The number of mature plants per colony increased from 27 in 1985 to 38 in 1986, whereas the number in the unburned colony decreased from 51 in 1985 to 33, suggesting that *I. remota* benefits from controlled burning (Schwegman and Glass, 1986). Although stem number dramatically increased after canopy removal and controlled burns during 19 years of study, the greatest number of seedlings emerged after the brush piles were burned. This suggests that burning brush is an effective technique to promote seedling development, probably because the hot fire kills nearly all living vegetation in the area of the brush pile.

In late June of 2005, flower buds and open flowers were observed in abundance. Mean number of flower buds and open flowers calculated in this study, however, were low with overall number less than 2 flowers or flower buds per plant. The low numbers resulted since many stems were vegetative. According to Schwegman (1984), flowering in this species typically occurred throughout July and most of August. We observed almost no flowers in a second

visit to the site in late July. Flowers may have opened and fallen earlier due to the dry summer in 2005.

Seed germination rates of 40% were obtained after hot water treatment, indicating that fresh *Iliamna remota* seeds have a lower germination rate than older seeds (Schwegman, 1984). *Iliamna remota* seeds have been documented to survive in soil for at least 10 years, suggesting a significant seed bank for this species (Schwegman, 1990). Additional comparative studies, including seeds of differing age, would render more accurate information regarding seed longevity and germination percentages, which ultimately may be useful for conservation efforts for *I. remota*.

The associated woody vegetation appeared to overwhelm the *Iliamna remota* plants. Extensive woody encroachment resulted in excessive shading and decreased flower and fruit production. *Lonicera maackii* appears to be the most aggressive species, and is responsible for much of the shading. According to Schwegman (1984), *L. maackii* was introduced on the island in 1960, and he observed its rapid spread in 1983, where it was the most frequently occurring tall shrub on the island. This exotic, invasive species was found to be common throughout the island in 1991. A previous study has shown the adverse effect of this species on herbaceous species diversity (McDonnell et al., 2005). This study showed the effectiveness of concentrated glyphosate treatment on mechanically removed *L. maackii* shrubs, which may be a useful management tool for controlling *L. maackii* on Langham Island.

It is possible that *Poa pratensis* may adversely affect the germination and seedling establishment of *Iliamna remota*. This cool-season, Eurasian species forms a tight sod that may limit the resources available to *I. remota*. Further studies to determine the effects of this species on the growth and development of *I. remota* would be very useful. Presently, the use of early spring fire as a management tool would probably reduce the abundance of this exotic species on the island.

Overall, the *Iliamna remota* population appears to be surviving on Langham Island, and previous management practices have been effective in increasing stem numbers. Presently, the *I. remota* population has declined from the last survey in 2002. An increase in shading by the exotic shrub *Lonicera maackii*, and the tight sod of the exotic *Poa pratensis* appear to be responsible for this decline. The increase in abundance of these exotic species is the result of the lack of management. Therefore, the management plan outlined by Schwegman (1984) should be continued to ensure the survival of *Iliamna remota* on Langham Island.

Acknowledgments

The authors would like to thank Roger Diercks, GIS Specialist, Kankakee County, Illinois, for creating the high-resolution map; Steve DiNaso, GIS specialist, Eastern Illinois University, for ArcGIS assistance; Dan Kirk, Restoration Ecologist, Illinois Department of Natural Resources, for information and help on the island; William Glass, Ecologist, Midewin Natural Tallgrass Prairie, for pertinent *Iliamna remota* information and data; and Steven Hill, Botanist, Illinois Natural History Survey, for relevant *Iliamna remota* information and editorial comments for this manuscript, and the Illinois Nature Preserves Commission for permission to conduct the survey.

References

Bodo Slotta, T. 2000. Phylogenetic Analysis of *Iliamna* (Malvaceae) Using the Internal Transcribed Spacer Region. Virginia Polytechnic Institute and State University. Master's Thesis. 70 pp.

Center for Plant Conservation (CPC). 2006. From the website: http://www.centerforplantconservation.org/ASP/CPC_ViewProfile.asp?CPCNum=2310 Retrieved on August 3, 2006.

Glass, W., J. E. Schwegman, R. R. Heidorn, and W. E. McClain. 2003. Twenty Years of the Endangered Kankakee Mallow (*Iliamna remota* Greene, Malvaceae) on Langham Island, Kankakee County, Illinois. Illinois Department of Natural Resources report. Springfield, Illinois. 5 pp.

Herkert, J. R. and J. E. Ebinger. 2002. editors. Endangered and Threatened Species of Illinois: Status and Distribution. Volume 1: Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. i+161 pp.

Hilscher, S. L. and J. E. Preece. 1994. Micropropagation of *Iliamna remota*, Kankakee mallow. HortScience 29:562 pp.

Jones, G. N. 1952. Type localities of vascular plants first described in Illinois. American Midland Naturalist 47:487–507.

McDonnell, A. L., A. M. Mounteer, H. R. Owen, and B. L. Todd. 2005. Influence of stem cutting and glyphosate treatment of *Lonicera maackii*, an exotic and invasive species, on stem regrowth and native species richness. Transactions of the Illinois State Academy of Science 98:1–17.

McFall, D. and J. Karnes. 1995. editors. A directory of Illinois Nature Preserves, Volume 1. Northeastern Illinois. Illinois Department of Natural Resources, Springfield, Illinois. iv+195 pp.

Mohlenbrock, R. H. 2002. Vascular flora of Illinois. Southern Illinois University Press, Carbondale, Illinois. x + 490 pp.

Paschke, J. E. 1979. Soil survey of Kankakee County, Illinois. United States Department of Agriculture, Soil Conservation Service, in cooperation with the Illinois Agricultural Experiment Station, Champaign, Illinois. iii+84 pp.

Rydberg, P. A. 1913. Studies on the Rocky Mountain Flora – XXVIII. Bulletin of the Torrey Botanical Club 40:43–74.

Schwegman, J. E. 1984. State of Illinois Recovery Plan for *Iliamna remota* Greene. Division of Forest Resources and Natural Heritage. Illinois Department of Conservation. January 1984.

Schwegman, J. E. 1988. Vascular flora of Langham Island, Kankakee County, Illinois. Erigenia 10:60–73.

Schwegman, J. E. 1990. Preliminary results of a program to monitor plant species for management purposes. pp. 113–116 *In* R. S. Mitchell, C. J. Sheviak, and D. J. Leopold, eds., Ecosystem Management: Rare Species and Significant Habitats. Proceedings of the 15th Annual Natural Areas Conference. New York State Museum Bulletin Number 471.

Schwegman, J. E. 1991. The vascular flora of Langham Island, Kankakee County, Illinois. Erigenia 11:1–8.

Schwegman, J. E. and W. Glass. 1986. 1986 Status report on *Iliamna remota* in Illinois. Illinois Department of Conservation, Springfield, Illinois. 5 pp.

Sherff, E. E. 1946. Notes on certain plants in the Gray's Manual range. Rhodora 48:89–98.

Sherff, E. E. 1949. Miscellaneous notes on dicotyledonous plants. American Journal of Botany 36:499–511.

Strausbaugh, P. D. and E. L. Core. 1932. *Phymosia remota*. Rhodora 34:142–146.

United States Department of Agriculture (USDA). 2006. From the website: http://plants.usda.gov/java/profile?symbol=ILRIR&photoID=ilre_001_ahp.jpg Retrieved on August 3, 2006.

Wiggins, I. L. 1936. A resurrection and revision of the genus *Iliamna* Greene. Contributions from the Dudley Herbarium of Stanford University 1: 213–231.

Erigenia, Number 21, November 2006, pp 40–43

Echinodorus berteroi var. *lanceolatus*: A Species New to Northeastern Illinois

Robert Van Lonkhuyzen[1], Kenneth Dritz[2], and Kenneth Johnson[3]

Abstract: *Echinodorus berteroi* var. *lanceolatus* is an obligate wetland species with scattered populations throughout the southern three-fourths of Illinois, as well as Carroll County and Bureau County in northwest Illinois. Until its recent discovery in Will and Kane Counties, however, this species was unknown from the northeast part of the state. The wetland communities in which *E. berteroi* was found include species of *Potamogeton*, *Eleocharis*, *Alisma*, and *Scirpus*.

New distribution records of species occurring in Illinois are not uncommon. In recent years, the distributions of many non-native species in Illinois have increased dramatically, and new county records of native species also are established regularly.

Echinodorus berteroi (Spreng.) Fassett var. *lanceolatus* (Engelm. ex Wats. & Coult.) Fassett, commonly known as bur-head, in the family Alismataceae, is a native Illinois species that was unknown in the northeastern part of Illinois (Swink and Wilhelm 1994) until recently. This paper describes two new population records for this species in the state of Illinois, particularly in northeast Illinois. The species was discovered in Will County on September 9, 1995 (*Johnson 2561*, MOR), and in Kane County on September 5, 2003 (*Dritz 1542*, MOR). Both locations are situated a considerable distance from the nearest known populations.

Upon casual observation, *Echinodorus berteroi* var. *lanceolatus* bears a superficial resemblance to *Alisma*, *Lophotocarpus*, and *Sagittaria*, other members of Alismataceae. Similarities include the general aspect of the plants, their leaf forms and their flowers, which bear three white petals. A technical description of *E. berteroi* var. *lanceolatus*, synthesized from Fernald (1950), Hickman (1993), Yatskievych (1999), Mohlenbrock (1970 and 2002), Gleason (1952), and Gleason and Cronquist (1991), follows.

> Fibrous-rooted, emergent aquatic annual or short-lived perennial; leaves basal, sheathing, the blade broadly ovate, obtuse, cordate or truncate at the base, about 15 cm long and 10 cm broad (ranging from 2–60 cm long and from 0.5–12 cm broad), sometimes lanceolate and with the base more tapering in smaller plants, glabrous, the angled petiole longer than the blade, with 5–7 primary veins palmately arching from the base of the midrib and rejoining near the apex, these connected by finer transverse veins; scape erect, 1–6 dm high, longer than the leaves; inflorescence a raceme of whorled flowers, sometimes branched at the base or from the lower verticils (then appearing paniculate), the (1) several verticils with many bracteoles in addition to the 3 lanceolate or linear 3–6 mm bracts; flowers 3–8 in each verticil, perfect, 8–10 mm broad, on stiffly ascending angled pedicels to 20 mm long; receptacle convex; sepals 3, dark green, ovate, acute, 4–5 mm long, persistent, reflexed in fruit; petals 3, white, broadly ovate to suborbicular, acute, 5–10 mm long, deciduous; stamens 12, the anthers 0.5–0.8 mm long, versatile, shorter than the filaments; pistils more than 40, arranged in several series on the expanded receptacle, the styles longer than the ovaries; fruiting head 3–7 mm thick, echinate in profile; achenes turgid, not winged, 2.5–3.5 mm long, brown, each side with 5 arching ribs, 2 of them wing-like and alternating with the others, the keel entire, the straight beak 0.5–0.8(–1.0) mm long and attached obliquely; embryo pitted; $2n = 22$.

Echinodorus differs from *Alisma* in that it has several series of pistils on a large, convex receptacle (rather than a single whorl on a small, flat receptacle).

[1] Environmental Science Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.
[2] Decision and Information Sciences Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.
[3] Conservation Design Forum, 375 West First Street, Elmhurst, Illinois 60126.
Argonne work supported by United States Department of Energy under contract DE-AC02-06CH11357.

It differs from *Lophotocarpus* and *Sagittaria* in that it has turgid, unwinged achenes (rather than flattened, winged achenes) and bracteoles (in addition to bracts), subtending the verticils. In Illinois, *E. berteroi* flowers from July to September (Mohlenbrock 2002).

The taxon was named by Fassett (1955). Synonyms, as given in Mohlenbrock (1970), are as follows.

Alisma rostratum Nutt. Trans. Am. Phil. Soc. 5:159. 1837.
Echinodorus rostratus (Nutt.) Engelm. in Gray, Man. 460. 1848.
Echinodorus rostratus var. *lanceolatus* Engelm. ex Wats. & Coult. in Gray, Man. 556. 1891.
Echinodorus cordifolius (L.) Griseb. var. *lanceolatus* (Wats. & Coult.) Mack. & Bush, Man. Fl. Jackson Co. Mo.10.1902.
Echinodorus cordifolius f. *lanceolatus* (Wats. & Coult.) Fern. Rhodora 38:73. 1936.
Echinodorus rostratus f. *lanceolatus* (Wats. & Coult.) Fern. Rhodora 49:108. 1947.

The last of these synonyms is the name by which the plant is known in *Gray's Manual* (Fernald 1950).

Echinodorus berteroi is widespread across much of North America. The range of the species extends from Mexico and the West Indies to Texas and California (Hickman 1993), north in the Mississippi River drainage to South Dakota, Wisconsin, and Ohio; populations also exist from Ontario to Florida. It occurs as an exotic species in Hawaii (Wagner et al. 1999). Plants in the northeast and midwest United States are var. *lanceolatus*. Typical var. *berteroi* is from the southwest United States, Central America (Wiggins 1980), and the West Indies.

Populations near Illinois are known from Wisconsin, Iowa, Missouri, Kentucky, and Indiana. In Wisconsin, *E. berteroi* is designated as a species of special concern and is known only from Sauk County (WBIS 2004, WDNR 2004), where it was collected in 1968, more than 130 km from the nearest known Illinois population and nearly 200 km from the Kane County location. It is known from five counties in extreme western Iowa, 11 counties in Missouri, and three counties in Kentucky, where it is listed as a threatened species (USDA 2004). *E. berteroi* historically occurred in Indiana, but is now presumed extirpated from that state (IDNR 2002), although *E. parvulus* (= *E. tenellus*) was discovered in Newton County in 1994.

In the early 1960s, *Echinodorus berteroi* was considered rare in Illinois (Jones 1963). Currently, this species is local and scattered throughout the southern three-fourths of the state, and it is also known from Carroll County and Bureau County in northwest Illinois (Mohlenbrock 1970, 2002, USDA 2004). Bureau County is 70 km from the Kane County site and 75 km from the Will County site, while Carroll County is more than 100 km from each. The apparent absence of *E. berteroi* from northeastern Illinois until recently may raise questions regarding its status as a native species in that area.

E. berteroi is classified as an obligate wetland species in all regions in which it occurs; such species occur almost always (estimated probability > 99%) under natural conditions in wetlands (Reed 1988). The habitats in which *E. berteroi* is found are variously described as swamps and ditches, often on sandy soil (Gleason and Cronquist 1991); muddy shores and bottoms (Fernald 1950); wet ditches and edges of swamps (Mohlenbrock 1970 and 2002); shores of ponds (Jones 1963); and shallow ponds, marshes, and ditches (Wunderlin 1982).

The Kane County site is a recently restored pothole wetland located in the NE¼ SE¼ of Sec. 24, T39N, R7E (Sugar Grove quad, 1993). The site is approximately 0.5 km northeast of Nelson Lake Marsh (Dick Young Forest Preserve). The Will County site is an artificial pond surrounded by cultivated and formerly cultivated fields in the NW¼ SE¼ of Sec. 30, T34N, R9E (Channahon quad, 1993), in the northern part of McKinley Woods Forest Preserve, about 3 km south of Channahon, Illinois.

The Kane County wetland is oval-shaped and ca. 1 ha in size, lying in a shallow depression. The plant communities form somewhat concentric zones, with a large, relatively flat, central area at the lowest elevation. The site was visited in September 2003 and again in August 2004. The entire wetland was dry during the 2003 visit, but had been inundated until mid-August of that year. It was inundated to a water depth of approximately 0.6 m during the 2004 visit. In 2003, the central zone supported primarily *Echinochloa crusgalli* and *Cyperus esculentus*, with *Abutilon theophrasti* and *Xanthium strumarium* also present. In 2004, this zone was composed nearly entirely of *Alisma subcordatum* and *Alisma triviale*, with *Potamogeton nodosus*, *Lemna minor*, and *Spirodela polyrhiza*.

At this location, *Echinodorus berteroi* occurs within a zone immediately surrounding the central community. In August 2004, this zone was shallowly inundated up to 0.4 m in depth. *E. berteroi* occurs frequently within this zone, in areas with a somewhat open vegetation structure, primarily in the lower portion of the zone. Associates within this zone include *Acnida altissima*, *Alisma subcordatum*, *Alisma triviale*, *Ammannia robusta*, *Bidens cernua*, *Bidens coronata*, *Eleocharis obtusa*, *Eleocharis smallii*, *Leersia oryzoides*, *Lemna minor*, *Lindernia dubia*, *Polygonum coccineum*, *Potamogeton natans*, *Potamogeton pectinatus*, *Proserpinaca palustris*, *Scirpus fluviatilis*, *Scirpus validus* var. *creber*, *Sparganium* sp., *Spirodela polyrhiza*, *Typha*

angustifolia, *Typha latifolia*, and *Typha* × *glauca*. Five rare species previously unknown from Kane County also occur within this zone: *Eleocharis engelmannii*, *Eleocharis macrostachya*, *Lophotocarpus calycinus*, *Najas guadalupensis*, and *Nelumbo lutea*. Currently, most of this community consists of a dense growth of *Scirpus fluviatilis*, with some areas in the middle and upper portions supporting dense growths of *Typha* spp. The lower portion of this zone is less densely vegetated and supports a greater diversity of species. The most common species there are *Alisma* spp., and only scattered stems of *Scirpus fluviatilis* are present.

An outer wetland community, at slightly higher elevations, is composed of *Aster simplex*, *Bidens comosa*, *Boltonia latisquama recognita*, *Carex vulpinoidea*, *Echinochloa walteri*, *Eleocharis smallii*, *Lycopus americanus*, *Mentha arvensis* var. *villosa*, *Polygonum erectum*, *Polygonum pensylvanicum*, and *Scirpus atrovirens*. *Spartina pectinata* has been planted in the lower portion of this community.

This location had previously been drained for agricultural use and was farmed until 1999. It then lay fallow until the Kane County Forest Preserve District removed a system of agricultural drainage tiles from the wetland in January 2002, restoring the hydrologic regime. The wetland has since become inundated annually, and it attracts numerous water birds. Mallard ducks and sandhill cranes, as well as other species, feed in the wetland each year. Management activities since tile removal have included control of the *Typha* spp. to allow for the development of a more diverse plant community.

Echinodorus berteroi was unknown from the site in 2002. It increased in this wetland from 2003 to 2004. It occurred sporadically in the mid-elevation zone in 2003, but it has since become distributed around more of the wetland. However, *Scirpus fluviatilis* has also increased each year since 2002, and that may, over time, result in a decrease of the population of *E. berteroi* as light penetration decreases.[4]

The Will County wetland is ca. 0.1 ha in size. It is positioned within a shallow swale, situated at the head of a ravine. The northern portion of the wetland frequently contains a small pond, created by an earthen dam across the swale. The site was visited in September 1995, September 1996, and again in August and September 2004. During the 1995 and 1996 visits, the northern area was shallowly inundated, up to approximately 0.4 m in depth. However, it was inundated to a depth of greater than 0.6 m during the 2004 visit. This low-elevation area is dominated by *Echinochloa crusgalli*.

In 1995 and 1996, *Echinodorus berteroi* occurred on the exposed muddy bank of the pond. A small number of individuals (fewer than 10) were present both years, all located in fairly close proximity. The vegetation community immediately around the pond had an open structure, with areas of exposed substrate. Associated species in this community in 1995 were *Eclipta protrusa*, *Xanthium strumarium*, *Lippia lanceolata*, *Echinochloa crusgalli*, and *Penthorum sedoides*. In 1996, the community was composed of *Acnida altissima*, *Bidens frondosa*, *Echinochloa crusgalli*, *Eclipta protrusa*, *Eleocharis acicularis*, *Eragrostis hypnoides*, *Leersia oryzoides*, *Lindernia dubia*, *Lippia lanceolata*, and *Ludwigia palustris americana*.

Echinodorus berteroi was not found during visits in August and September 2004 and is apparently extirpated from this site. The area in which *E. berteroi* had occurred is now densely vegetated, primarily with *Echinochloa crusgalli* and *Polygonum punctatum*. This community becomes inundated intermittently during high water levels, as was observed during the August 2004 visit but not in the September visit, two weeks later.

Although *Echinodorus berteroi* has not been documented from other areas in northeast Illinois, we speculate that it may occur in other wetlands in the area, such as Nelson Lake Marsh. *E. berteroi* and the other species present at the Kane County site may represent historic populations that have returned following restoration of the wetland. It is also possible that waterfowl may transport seeds of *E. berteroi* to new locations, such as those in Kane and Will Counties. It is our expectation that additional populations will be discovered in other northeast Illinois counties in coming years, perhaps in newly developing wetlands with exposed substrates, as are often present on new wetland restoration sites. At both the Kane and Will County sites, *E. berteroi* occurred in open vegetation communities where there were low levels of competition.

[4] *Lophotocarpus calycinus* increased greatly from 2002 to 2003, and perhaps again in 2004, but it, too, is in danger of being shaded out by *Scirpus fluviatilis*. *Eleocharis macrostachya*, which has not been abundant in any of the years in which the site has been under observation, already appears to be losing ground to the *Scirpus*. *Nelumbo lutea* has not been observed since 2002 and may already be extirpated from this site.

References

Fassett, N. C. 1955. *Echinodorus* in the American Tropics. Rhodora 57:133–156, 174–188, 202–212.

Fernald, M. L. 1950. Gray's Manual of Botany. 8th edition. American Book Company, New York, New York.

Gleason, H. A. 1952. The New Britton and Brown Illustrated Flora of the Northeastern United States

and Adjacent Canada. Volume 1. New York Botanical Garden/Hafner Press (Macmillan Publishing Co.).

Gleason, H. A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. 2nd edition. New York Botanical Garden.

Hickman, J. C. 1993. editor. The Jepson Manual. Higher Plants of California. University of California Press.

Indiana Department of Natural Resources (IDNR). 2002. Endangered, Threatened, and Rare Vascular Plant Species Documented from Indiana. Division of Nature Preserves. Available at www.in.gov/dnr/naturepr/endanger/plant.html. Accessed August 18, 2004.

Jones, G. N. 1963. Flora of Illinois. 3rd edition. The American Midland Naturalist, Monograph No. 7, R. E. Gordon, editor. University of Notre Dame Press, Indiana.

Mohlenbrock, R. 2002. Vascular Flora of Illinois. Southern Illinois University Press, Carbondale and Edwardsville, Illinois.

Mohlenbrock, R. 1970. The Illustrated Flora of Illinois, Flowering Plants: Flowering Rush to Rushes. Southern Illinois University Press, Carbondale, Illinois.

Reed, P. B., Jr 1988. National list of plant species that occur in wetlands: national summary. Biol. Rep. 88(24). U.S. Fish and Wildlife Service.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region. 4th edition. Indiana Academy of Science.

U.S. Department of Agriculture (USDA). 2004. The PLANTS Database, Version 3.5. Natural Resource Conservation Service, National Plant Data Center, Baton Rouge, Louisiana. Available at plants.usda.gov.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii (revised edition). Volume 2. University of Hawaii Press/Bishop Museum Press.

Wiggins, I. L. 1980. Flora of Baja California. Stanford University Press.

Wisconsin Botanical Information System (WBIS). 2004. Wisconsin State Herbarium, University of Wisconsin-Madison. Available at www.botany.wisc.edu/wisflora/scripts/detail.asp?SpCode=ECHBER. Accessed August 18, 2004.

Wisconsin Department of Natural Resources (WDNR). 2004. Endangered resources map, Sauk County. Bureau of Endangered Resources. Available at dnr.wi.gov/org/land/er/workinglists/countymaps/sauk.2004.pdf.

Wunderlin, R. P. 1982. Guide to the Vascular Plants of Central Florida. University Presses of Florida.

Yatskievych, G. 1999. Steyermark's Flora of Missouri. Volume 1. Missouri Department of Conservation/Missouri Botanical Garden Press, St. Louis, Missouri.

NVITATION FOR SUBMISSION OF ARTICLES

RIGENIA is a peer-reviewed journal of the Illinois Native lant Society. We invite the submission of original articles n the biota of Illinois and adjacent states. This is a partial st of articles of interest to society members.

AXONOMY of vascular plants, fungi, lichens, and nosses

COLOGY of native species and plant communities; nteractions and effects of birds, mammals, and insects n our ecosystem

NATURAL HISTORY of our state, including geology and eography

THNOBOTANY of native plants, their use by Native mericans

ULTURAL HISTORY as it intersects with natural history

OTANISTS, SCIENTISTS, EXPLORERS, and BOTANICAL RTISTS who have played a major role in our understanding f our state and its natural resources

ESTORATION of our native landscapes, management echniques and results

ORTICULTURE as it relates to native plants in restored or ultural environments

Material for Flora Updates should be sent to:

Marty Vogt
4252 Humphrey Street
St. Louis, Missouri 63116
mvogt@accessus.net
314-771-7593

Please refer to the next column for information on submitting other manuscripts.

INSTRUCTIONS FOR AUTHORS

Authors may submit material as an e-mail attachment to Gordon Tucker at cfgct@eiu.edu or on diskette sent to:

Dr. Gordon C. Tucker
Department of Biological Sciences
Eastern Illinois University
600 Lincoln Avenue
Charleston, Illinois 61920-3099 U. S. A.

Manuscripts must be submitted as an MS Word document in a single font, double-spaced, and left-aligned. Tables and illustrations must fit in a 7 x 9 inch area. Authors should retain copies of all material submitted.

The title page of the manuscript should state the affiliation and complete addresses of all the authors; the telephone number of the corresponding author should also be supplied. All papers will be reviewed and copy-edited.

ABSTRACTS

Research and technical papers should include a one-paragraph abstract of not more than 250 words. The abstract should state concisely the goals, principal results, and major conclusions of the paper.

TAXONOMIC NAMES

Either a standard taxonomic manual should be cited whose names are followed consistently, or the scientific names should be followed by their authority. Common names, if used, should be referenced to a scientific name. Thereafter, scientific names are recommended, but either may be used if done so consistently.

PROOFS

Authors will have the opportunity to review their articles before publication and are expected to correct any errors. The proofs should be returned within one week of receipt.

PAGE CHARGES

Page charges of $15 for members and $25 for non-members will be assessed. The fee will be waived for those who sign a statement that they neither have institutional support for publication nor can afford the page charges.

Illinois Native Plant Society
Forest Glen Preserve
20301 East 900 North Road
Westville, Illinois 61883

Contents *Erigenia* 21, November 2006